University of Alberta

The Effect of Choice of Activity Group on Exercise Adherence

by

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Abstract

The purpose of the study was to evaluate the influence of choice of activity group on exercise adherence (B). Data were collected over 16-weeks to determine the effect of choice of program on autonomy, perceived behavioural control (PBC), self-efficacy (SE), and identified and intrinsic regulation, to predict behavioural intentions (BI), B, and change in fitness level. Participants aged 25-65 (N=240) were randomized to a choice (CC) or no-choice condition (NC). NC was further randomized to the fitness centre activity (FC) or the walking activity (W), and CC participants chose one. ANOVA for the effect of choice on B was significant $F(1, 240) = 3.79$, $p < .05$, revealing that CC better adhered to exercise than did NC. Results showed that autonomy, identified regulation, task, and scheduling efficacy were significant predictors of either T2 BI or B. Results highlight the need for future research in the choice and exercise domain.

Dedication

This thesis is dedicated to several people: To Chris, for allowing me to follow my dreams, and for being there every step of the way; to my parents and family for teaching me to strive for academic excellence; and to Dr. Wendy Rodgers for her knowledge, experience, and her strength in helping me to succeed. May 'Rodgers Raiders' live on.

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THE EFFECT OF CHOICE OF EXERCISE ACTIVITY GROUP ON EXERCISE ADHERENCE

One essential aspect of a healthy lifestyle that most individuals struggle with is exercise. Adherence to exercise is a major health concern among men and women of all ages and research indicates that there is both an initiation as well as a maintenance problem. For example, 50% of participants 'dropout' of exercise programs within the first six months (Dishman, 1994). This could be a result of a variety of factors or excuses such as lack of time, muscle pain, or lack of self-confidence. However, physical activity and exercise are essential to good health (Canada's Physical Activity Guide, 2004); therefore, effective ways to improve exercise initiation and adherence are required.

One possible explanation for non-adherence to exercise may be a lack of control or feelings of independence that individuals have over their exercise decisions. Anecdotally, individuals want to have choice or some type of control over their behaviour, including exercise. Letting people have more choice might enhance feelings of personal control (Iyengar & Lepper, 2002), which may in turn, improve adherence.

Self-Determination Theory

One psychological theory that clearly examines choice and its merits is self-determination theory (SDT; Deci & Ryan, 1985, 1991, 2002). SDT highlights the motivational regulations underlying behaviour. The theory addresses the degree to which the motivation toward an activity is internalized and how varying levels of self-determination influence actions or behaviours and their outcomes. It also considers inherent growth tendencies and innate psychological needs that are the basis for self-motivation and personality integration, as well as the conditions that foster these positive

processes. SDT focuses on the conditions that facilitate versus forestall self-motivation and healthy psychological development. It addresses the factors that enhance versus undermine motivation and the types of motivation that are associated with more positive consequences. SDT involves two sub-theories: Organismic Integration Theory (OIT) and Cognitive Evaluation Theory (CET), which will each be discussed.

Organismic Integration Theory (OIT)

The first subtheory, OIT, provides an account of different forms of extrinsic motivation and the factors believed to affect behavioural regulation. SDT has identified a continuum of behavioural regulation reflecting varying levels of motivation ranging from external, introjected, identified, integrated, through to intrinsic regulation (Ryan & Deci, 2000a, 2000b). This regulatory continuum includes motivational styles that differ in their relative degree of autonomy. *External regulation* describes behaviours that are performed to satisfy an external demand or to obtain an external reward. This type of motivation is the least autonomous form of regulation, since behaviours are based solely on factors peripheral to the self. The second type of extrinsic motivation is *introjected regulation*, in which case behaviours are performed to avoid shame or guilt, and to increase one's sense of self-worth. Introjection is associated with low levels of autonomy. The third type is *identified regulation* which refers to consciously valuing a behavioural goal, such that the person accepts the action as personally important, and is associated with a more autonomous regulatory style. The last and most self-determined type of extrinsic motivation is *integrated regulation,* which refers to behaviours that are performed to bring coherence to the self. Integration is much like intrinsic motivation, however, behaviours are still carried out to attain outcomes separable from the task rather than for

sheer enjoyment. The most autonomous and self-determined form of regulation is *intrinsic regulation*, which occurs when one engages in an activity in the absence of extrinsic rewards. Activities are completed for interest, enjoyment, and inherent satisfaction (Deci & Ryan, 1985, 1987, 1991, 2002). In this theory then, the most autonomous regulations include intrinsic, integrated, and identified, whereas external and introjected regulations are considered to be the least autonomous and most controlling regulations.

These different forms of behavioural regulation are hypothesized to influence behaviour in specific ways. Research suggests that adherence is associated with more self-determined motivation for behaviour (Ryan & Deci, 2000b). The practical importance of distinguishing between these motivational qualities is that a growing body of research shows that more positive consequences ensue from autonomous regulations (identified and intrinsic) as opposed to controlling ones (introjected and extrinsic).

Research has also shown that intrinsic motivation is strongly associated with adherence to exercise, whereas extrinsic motivation is associated with dropping out (Chatzisarantis & Biddle, 1998). It follows that when behavioural regulations become stable and highly self-determined the relationship between intentions and behaviour should be stronger (Chatzisarantis & Biddle, 1998).

Cognitive Evaluation Theory (CET)

The second subtheory of SDT is CET, which specifies factors that explain variability in intrinsic motivation. CET posits that there are social and environmental factors that enhance versus undermine intrinsic motivation, self-regulation, and well-being (Ryan & Deci, 2000a). The theory assumes that intrinsic motivation is inherent,

and therefore will emerge in specific situations that allow it (Ryan & Deci, 2000a). The theory suggests that the satisfaction of innate psychological needs is required for intrinsic motivation to flourish. The three needs are autonomy, competence, and relatedness, which, when fulfilled, yield enhanced self-motivation and when unsatisfied lead to diminished motivation and well-being. The extent to which any behaviour or context meets these needs corresponds to the form of regulation, which is believed to correspond, in turn, to the likelihood that the person will repeat this behaviour.

Basic Psychological Needs

Autonomy can be defined as the feeling of volition that can accompany any act, whether the act is perceived as dependent or independent, collectivist or individualist (Ryan & Deci, 2000a). Autonomy is facilitated by contexts that allow one to choose one's actions. The psychological need for competence refers to a person's sense of efficacy for behaviour. It is believed that individuals are more likely to adopt activities when they feel efficacious toward those activities (Ryan & Deci, 2000a), and it refers to the need to feel effective and to have control within one's environment. Competence is facilitated by optimal challenges and supportive feedback. Relatedness signifies a sense of belonging and connecting to other people and situations (Deci & Ryan, 1985), through meaningful interactions with intimate others and social groups. Perceptions of warmth, caring, and a sense of significance facilitate satisfaction of the psychological need of relatedness. These innate psychological needs must be satisfied or intrinsic motivation is affected in negative ways. For example, research revealed that threats, deadlines, and imposed goals tend to diminish intrinsic motivation as they result in an external locus of causality (Ryan & Deci, 2000a). In contrast, choice, acknowledgement of feelings, and

self-directed opportunities tend to increase intrinsic motivation because they support the need for autonomy (Ryan & Deci, 2000a).

Autonomy-choice Links

The innate psychological need of autonomy is most related to choice in the exercise setting (Biddle, 1999; Biddle, Soos, & Chatzisarantis, 1999; Ntoumanis, 2001). Autonomy can refer to a sense of being choiceful in one's actions and experiencing oneself as the locus of initiation of those actions (Deci & Ryan, 1985). Autonomy has also been referred to as the 'self-determination' construct, and is principally concerned with the perception of choice in engaging in behaviour (Markland, 1999). Autonomous behaviour regulation is associated with long-term behavioural persistence (Ryan & Deci, 2001) and is the strongest correlate of exercise behaviour and adherence (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). When autonomous, people experience themselves as initiators of their own behaviour; they select desired outcomes and choose how to achieve the outcomes (Deci & Ryan, 1987). This encapsulates the two major themes underlying the concept of autonomy. The themes are "perceived choice" (Wilson, 2004) and "internal perceived locus of causality" (deCharms, 1968; Deci & Ryan, 1985, 2002).

Autonomy also includes the connection between action and volition, and the extent to which a person feels free to engage in choiceful behaviours. An event that supports autonomy encourages the choice process. With regard to exercise, an autonomous feeling is meant to encapsulate the perception that the exercises completed reflect the participant's choices and values and are carried out based on the individual's own decisions (Wilson, 2004). Previous research shows that the construct of autonomy

appears to be important in the prediction of adherence and of physical activity behaviours (Biddle, 1999; Buijs, Ross-Kerr, O'Brien-Cousins, & Wilson, 2003; Wilson, 2004; Wilson, Rodgers, Blanchard, & Gesell, 2003).

There is a link between choice and autonomy as demonstrated in the literature. In all cases, where participants have more choice, they also have more autonomy. This link is supported in the medical literature (Jepson, Hewison, Thompson, & Weller, 2005; McNamara, 2004; Reinhardy, 1999; Stigglebout, Molewijk, Otten, Timmermans, van Bockel, & Kievit, 2004; Williams, Rodin, Ryan, Grolnick, & Deci, 1998), in research with children in the school setting (Assor, Kaplan, & Roth, 2002; Milner-Bolotin, 2002; Neighbors & Larimer, 2004; Picariello, 1995), and in the exercise literature (Neighbors & Knee, 2003; Vansteenkiste, Simons, Soenens, & Lens, 2004).

Some studies have shown that promoting self-determined forms of behavioural regulation through greater choice or autonomy-supportive environments may be a rewarding way of enhancing intentions to be physically active (Biddle, 1999; Biddle, et al., 1999; Ntoumanis, 2001). Additional research demonstrates that allowing for availability of choice increases levels of autonomy, which makes the individual feel more positive about the situation and enhances adherence to exercise (Deci & Ryan, 1987, 2002; Hassandra, Goudas, & Chroni, 2003; Ntoumanis, 2001; Rogers, 2002). Choice allows individuals a chance to act out of a sense of autonomy instead of obligation, allowing a sense of control over the pertinent situation (Iyengar & Lepper, 2002).

Choice

There is limited literature on the influence of choice on behaviour in the exercise domain; however the available literature is promising. Research shows that choice allows for increased adherence through its ability to promote greater control, motivation, and confidence when carrying out behaviour (Ajzen, 2002; Biddle, 1999; Deci & Ryan, 1987; Kavussanu & Roberts, 1996; Rodgers & Sullivan, 2001). Most importantly, the effects of enhanced perceptions of choice have been shown to positively influence exercise adherence (Daley & Maynard, 2003; Heesch, Masse, & Aday, 2000; Markland, 1999; Parfitt & Gledhill, 2004). In general, these studies showed that simply allowing a small amount of control to the participant, such as a preferred mode of exercise increased adherence to the exercise program compared to those who were forced to follow an exercise program without any choice in the matter. Previous research demonstrated significantly greater exercise program attendance and intentions to continue to attend among participants who were led to believe that their preferred activities had been taken into account (Markland, 1999; Thompson & Wankel, 1980). The limited yet promising evidence for choice in the exercise domain shows that its investigation is warranted and further justification of the benefits of choice in exercise programs is required.

A clear definition of what exactly would constitute perceived choice by exercise participants has yet to be clearly determined. As stated above, researchers have shown that relatively small choices seem to influence behaviour. Examples include giving participants a choice of exercise modality (Parfitt & Gledhill, 2004), choice of food (Baumeister, Bratslavsky, Muraven, & Tice, 1999; Berg, Jonsson, & Conner, 2000; Bissonette & Contento, 2001; Devine, 2005; Goldfield & Epstein, 2002), choice of

assignment topic (Milner-Bolotin, 2002) etc. However, with respect to exercise, even when participants are given no choice, it is still possible for exercisers to "choose" aspects of their activity. For example, in a traditional exercise program, individuals are still able to "choose" aspects such as time of day, facility, or modality (e.g. treadmill or bike).

Choice is typically defined as a deliberate decision by a participant of one alternative behaviour rather than proffered others. Choice and preference are not necessarily the same, because a person's true preference (i.e. what they would really like to do) may not even be among the alternatives offered. It is possible that a person might prefer one offered alternative over another and this is assumed to be inherent in choice. It is possible therefore to distinguish between "choice" (i.e. the deliberate decision) and "preference" (i.e. what they really want to do). However, the literature is not explicit in the definition of these two concepts and the typical operationalization of choice has been through decision making in contexts such as health-related choices (Bechtel & Schreck, 2003; Russell, Dzewaltowski, & Ryan, 1999), or nutrition choices (Baumeister, et. al., 1999; Berg, et. al., 2000; Bissonette & Contento, 2001; Devine, 2005; Goldfield & Epstein, 2002; Horgen & Brownell, 2002).

Very little research has even examined choice at all. When choice has been examined, only one choice or one opportunity to make a decision about behavioural alternatives is offered (Ajzen & Driver, 1992; Daley & Maynard, 2003; Dwyer, 1995; Iyengar & Lepper, 2002; Milner-Bolotin, 2002; Parfitt & Gledhill, 2004; Prusak, 2000; Rokke & Lall, 1992). It seems that generally, only two alternatives are offered at that time, therefore, it is largely unknown how different operationalizations of choice, such as

number of choices, when the choice occurs, or how aspects such as moderating factors including the type of participant (e.g. men, women, elderly, patient groups, etc.) influence a choice manipulation and its subsequent effects.

Using the decision making operationalization, it is possible to support the general finding in the work of Roy Baumeister. Baumeister and colleagues have shown that under stressful circumstances (e.g. hunger) when people are restricted in food choice (radishes vs. chocolate), there are negative consequences for self-regulation in other stressful aspects of life. Specifically, self-regulatory efforts subsequent to a forced choice (no-choice) situation are more likely to fail. This could be applied to an exercise context in that choice may influence other aspects of a person's life, allowing for greater personal control and subsequent adherence.

Based on the limited literature available, and appealing to related literature that does not directly deal with choice, it appears that the main choice might have an effect on subsequent motivation. More importantly, one key decision over which a person has control is likely to give rise to increased autonomy, and subsequently to increased self-determined motivation according to SDT. In summary, in studies addressing choice in SDT, researchers have only considered limited choices and found various effects on autonomy, motivation, and adherence. The research is limited, yet promising, especially in an exercise context.

Choice, Autonomy and Motivational Regulation

Previous research demonstrates the association of choice to autonomy and its relationship to motivational regulation, illustrating the importance of these relationships in promoting adherence (Deci & Ryan, 1987, 1991, 2000; Farrell, Crocker, McDonough,

& Sedgwick, 2004; Knee, Neighbors, & Vietor, 2001; Milner-Bolotin, 2002; Ntoumanis, 2001; Pelletier, & Vallerand, 1996; Perlmuter, & Eads, 1998; Prusak, 2000; Skinner, 1996; Thill & Mouanda, 1990; Vansteenkiste, et al., 2004; Williams, et al., 1998). Inherent to SDT (Deci & Ryan, 1985, 2002) and to exercise behaviour is motivation and behavioural regulation. Initial work in SDT showed that supports for autonomy were critical for sustaining intrinsic motivation, whereas controlling environments undermined it (Deci & Ryan, 1985). Research shows that factors such as contingent rewards, pressures and controlling evaluations undermine intrinsic motivation, whereas supports for autonomy and optimal challenges facilitate it (Ryan & Deci, 2000a).

Previous literature showed that people are intrinsically motivated by contexts offering choice, whereas situations in which choice has been removed or limited have been shown to have negative consequences on intrinsic motivation (Iyengar & Lepper, 2002). It also seems that the mere perception of choice can increase intrinsic motivation (Iyengar & Lepper, 2002). In an exercise context it was found that perceived choice of music accompanying an aerobics video enhanced intrinsic motivation in comparison with a no-choice condition (Dwyer, 1995).

The other form of regulation that seems most relevant to the perception of choice is identified regulation. In exercise studies, a large proportion of participants report more identified than intrinsic regulation. This is possibly because it is very difficult to be fully intrinsically motivated to adhere to any behaviour including exercise (Wilson & Rodgers, 2002). Some research has shown that identified regulation may be a better predictor of adherence in the exercise context than intrinsic regulation (Wilson, 2004). Thus

examining the relationship between choice and identified regulation is particularly relevant to the exercise context.

Effects of Manipulating Choice

Manipulating choice can have various effects on behaviour through other frequently studied factors such as perceptions of control and self-efficacy (Ajzen, & Driver, 1992; Armitage & Conner, 1999; Berg, Jonsson, & Conner, 2000; Bissonnette, & Contento, 2001; Cleary, & Zimmerman, 2001; Escarti, & Guzman, 1999; Hagger, Chatzisarantis, & Biddle, 2002; Katula, McAuley, Mihalko, & Bane, 1998; Mathieu, Martineau, & Tannenbaum, 1993; Michie, Dormandy, French, & Marteau, 2004; Perlmuter & Eads, 1998; Rokke, Fleming-Ficek, Siemens, & Hegstad, 2004; Rokke & Lall, 1992; Schunk, 1995; Yang-Wallentin, Schmidt, Davidov, & Bamberg, 2003). These variables are related to exercise adherence and influence it quite strongly (Blanchard, Rodgers, Courneya, Daub & Knapik, 2002; Courneya, Friedenrich, Quinney, Fields, Jones, & Fairey, 2004; Courneya, Friedenrich, Sela, Quinney, & Rhodes, 2002; Courneya & McAuley, 1995). Because these are also control-related constructs it is possible that perceptions of choice might influence them although there is no known research on this topic.

Choice and Perceived Behavioural Control

Innate to the concept of choice are feelings of personal control or behavioural control, since being able to choose presumably provides the individual with greater control over the behaviour. This can also be applied to exercise behaviour (Chatzisarantis & Biddle, 1998; Courneya & McAuley, 1995; Hagger, et al., 2002; Rhodes & Courneya, 2003; Sniehotta, Scholz, & Schwarzer, 2005). Perceived behavioural control (PBC)

refers to the extent to which a person believes the behaviour is under his/her control, and how easy or difficult performance of the behaviour is likely to be (Ajzen, 1988). PBC also refers to the connection between behaviour and outcomes, and encompasses the extent to which a person feels capable of producing preferred, and preventing undesired events (Patrick, Skinner, & Connell, 1993). Both direct and indirect influences of PBC on behaviour are theorized. First, holding intention constant, the likelihood that behaviour will be carried out increases with greater PBC. Second, PBC will influence behaviour directly to the extent that perceived control reflects actual control (Armitage & Conner, 1999). Research shows that PBC is a significant predictor of exercise behaviour itself, rather than a predictor of behavioural intention (Armitage & Conner, 1999; Kerner & Grossman, 1998; Rhodes & Courneya, 2003; Terry & O'Leary, 1995). In general, research assessing the effects of PBC on exercise adherence shows that the more perceived control a person feels over exercise, the more likely he or she is to adhere to it (Ajzen, 1991; Armitage & Conner, 1999; Kerner & Grossman, 1998). Some researchers have suggested that the concept of PBC can be divided into perceived control and self-efficacy (SE) (Conner & Armitage, 1998; Terry, 1993; Terry & O'Leary, 1995), reflecting both external (perceived control) and internal (self-efficacy) aspects of behavioural control.

PBC and SE are hypothesized to be related (Ajzen, 2002; Rhodes & Courneya, 2003; Trafimow, Sheeran, Conner, & Finlay, 2002). Some research has shown that SE is a component of PBC, which can be split into self-efficacy (ease/difficulty, confidence) and controllability (personal control over behaviour, appraisal of the degree of autonomy associated with the behaviour) (Ajzen, 2002; Rhodes & Courneya, 2003). Self-efficacy is

related to PBC because both constructs have regulatory functions with respect to behaviour. Some studies that incorporated SE and PBC found that they made independent contributions to the prediction of intentions or behaviour (Armitage & Conner, 1999; Terry, 1993; Terry & O'Leary, 1995; White, Terry, & Hogg, 1994), suggesting that these are related, yet predict different aspects of the behavioural process. Results found that SE predicted intentions to be physically active but not the activity itself, whereas PBC predicted physical activity but not intention (Armitage & Conner, 1999; Conner & Armitage, 1998; Rhodes & Courneya, 2003; Terry & O'Leary, 1995). It is hypothesized that increased levels of SE and PBC could predict both intention and behaviour respectively.

Choice and Self-efficacy

Self-efficacy (SE; Bandura, 1986) is a commonly studied construct which can be defined as the belief in one's capabilities to organize and execute the courses of action required to produce given attainments, and the confidence to carry out tasks (Bandura, 1986). SE concerns judgments of what one can do with personal skills rather than the skills themselves (Biddle, 1999). The relation of choice to SE has been studied in various domains. There has been some research carried out on the effects of choice on self-efficacy and the results showed that providing an individual with a choice increased their feelings of self-efficacy (Frederick-Recascino & Schuster-Smith, 2003; Kavussanu & Roberts, 1996). In the exercise context, a study showed that when an individual is choicefully engaged in physical activity at the optimal level of difficulty, he/she feels challenged and efficacious (Frederick-Recascino & Schuster-Smith, 2003).

One approach to understanding self-efficacy (SE) is to split it into three types (Rodgers & Sullivan, 2001). These three types of SE are task efficacy, coping efficacy, and scheduling efficacy. Task efficacy refers to an individual's confidence in the ability to perform elemental aspects of behaviour. Coping efficacy refers to an individual's confidence in the ability to perform the behaviour under challenging circumstances, and scheduling efficacy refers to an individual's confidence in the ability to include exercise into his or her daily activities (Rodgers & Sullivan, 2001). All three types of SE are normally required to produce a full behaviour, including exercise adherence. Research has shown that task and scheduling efficacy predict adherence in cardiac patients (Woodgate, Brawley, & Weston, 2005); task efficacy predicts exercise adherence in previously sedentary women (Cox, Gorely, Puddey, Burke, & Beilin, 2003); and coping efficacy is found to be highest in consistent exercisers (Gyurcsik, Brawley, & Langhout, 2002). In general, SE affects a person's confidence level (Allison, & Keller, 2004; Blanchard, et al., 2002; Cousins & Tan, 2002; Dzewaltowski, Noble, & Shaw, 1990; Godin & Shepherd, 1985; Oman & Duncan, 1995; Plotnikoff, Brez, & Brunet, 2003), which may be improved through a manipulation such as choice of exercise program to facilitate adherence.

Another way to examine prediction of variance in exercise adherence is through combinations of constructs that may be affected by choice (Chatzisarantis, Hagger, Biddle, & Karageorghis, 2002; Hagger & Armitage, 2004; Hagger, et al., 2002). Perhaps the strongest and most researched combination of constructs in the health domain is the relationship between autonomy and PBC. This is a strong association as the two constructs have similar, connected definitions. Feeling autonomous incorporates a

perception of control over the behaviour or situation; therefore, feeling autonomous may influence the degree of PBC. Patrick, et al., (1993) examined what motivates children's behaviour. They showed that it is due to joint effects of perceived control and autonomy in the academic domain (Patrick et al., 1993). This study was conducted with children so results may not generalize to the exercising adult population, and so this needs to be examined.

The link between autonomy and PBC has been applied to the exercise domain (Biddle, 1999; Chatzisarantis & Biddle, 1998; Chatzisarantis, Biddle, & Meek, 1997). Research has shown that physical activity is predicted by autonomous, but not controlling intentions, and that fitness and social motives act as autonomous and self-determining forms of motivation (Biddle, 1999; Chatzisarantis, et al., 1997; Hagger, et al., 2002). In a study where manipulation allowed for a more autonomous group and a more controlled group, it was found that the relationship between PBC and intention was significant in the autonomous group but not in the controlled group (Chatzisarantis & Biddle, 1998). The association between autonomy and PBC and its relation to the exercise domain is emerging in the literature and supports the idea that both factors are important in the prediction of exercise behaviour.

Intrinsic Motivation and Perceived Behavioural Control

Another relationship that is observed in the literature is that of intrinsic motivation and PBC, with respect to choice. Psychologists contend that provision of choice will prove advantageous in increasing an individual's sense of control and feelings of intrinsic motivation (Iyengar & Lepper, 2002; Ryan, 1995). The constructs of intrinsic motivation, PBC and autonomy are interconnected as they are accompanied by an 'internal perceived

locus of causality' (deCharms, 1968; Deci & Ryan, 1985). They all include variations of perceived control that are internal, rather than external to the self.

When discussing cognitive evaluation theory (CET; Deci & Ryan, 1985) and physical activity, it has been shown that in an event with low levels of external control individuals feel self-motivated or autonomous because they perceive a high level of personal control in the situation. Furthermore, higher PBC was associated with higher levels of intrinsic motivation, showing more self-determined behavioural regulation. It has been shown that decreased external control not only enhances intrinsic motivation, but also increases the likelihood of adherence to an activity (Frederick-Recascino, & Schuster-Smith, 2003). Wilson, Rodgers, and Fraser (2002) used a combination of constructs from both SDT and TPB in examining motivation and behavioural regulation. Their measures included psychological need satisfaction (autonomy), PBC, exercise motivations, and exercise behaviour. Their results supported the positive relations between greater psychological need satisfaction (increased autonomy), more self-determined motives (identified and intrinsic regulation) and more frequent exercise behaviour.

The previous literature suggests a relationship between choice and autonomy positively influencing identified regulation, intrinsic regulation, PBC and SE, subsequently influencing intentions and exercise adherence. Based on the previous findings, we are proposing an effect as presented in Figure 1. As per SDT (Deci & Ryan, 1985, 1991, 2002), choice is expected to positively influence autonomy, which in turn, is expected to positively influence identified and intrinsic regulation. Theoretical evidence also shows that identified and intrinsic regulation are both expected to positively

influence exercise adherence. TPB (Ajzen, 1988, 1991, 2002) postulates that PBC and SE will influence behavioural intentions, which in turn, will affect behaviour itself (exercise adherence). Based on previous research, autonomy is expected to positively influence PBC and SE (Patrick, et al., 1993), and identified and intrinsic regulation are also proposed to influence intentions (Chatzisarantis & Biddle, 1998; Wilson, et al., 2002). By manipulating choice, we hypothesize that selected psychological variables will be influenced, which are expected to enhance exercise adherence in turn. It is possible that psychological and physiological changes could be interconnected. The physiological outcome of interest and the main health indicator of exercise behaviour, is fitness level.

Health and Fitness Indicator

Ultimately, the reasoning behind promoting exercise adherence is to improve fitness and, therefore, improve health. Fitness level is a biological indicator of exercise adherence and helps demonstrate the utility of exercise and physical activity in a tangible way. Research demonstrates that there is a correlation between an increase in physical activity and an increase in fitness in initially unfit individuals. Increased fitness is associated with reductions in mortality, showing that with sufficient intensity; regular physical activity increases longevity (Blair, Kohl, & Barlow, 1995; Paffenbarger, Kampert, & Lee, 1994).

It was often thought that cardio-respiratory exercise in a fitness centre was the only way to achieve health outcomes from exercise. However, lifestyle approaches to exercise such as walking programs may also confer health benefits and can be applied to a greater percentage of the population (Dunn, Andersen, & Jackicic, 1998). Several health and physical activity organizations have endorsed this notion, including the

American College of Sports Medicine (ACSM, 1995), the National Institutes of Health (NIH, 1996), the Surgeon General's Report (SGR, 1996), the American Heart Association (AHA, 1996), and the Centres for Disease Control (CDC, 1995). This 'lifestyle' approach was generated to address the observed increase in sedentary behaviour and its positive association with morbidity and mortality (Dunn, et al., 1998). One of the basic principles underlying the lifestyle approach is that 'doing something is better than doing nothing at all' and in relation to Canada's Physical Activity Guide (2004) the goal is to shift the sedentary population into the moderate effort category of activity, which should influence fitness level. Welk, Differding, Thompson, Blair, Dziura & Hart, (2000) found evidence for an association between walking 10,000 steps per day and traditional public health guidelines for exercise (> 30 minutes of moderate activity and/or 20 minutes of vigorous activity). Their results showed that participants who performed more than 30 minutes of activity in a day reached the 10,000-step figure 73% of the time, approaching the levels of activity associated with health benefits.

Therefore, in the current study we examined the effect of choice of activity group, (with a choice of a 'traditional' fitness centre activity group or a 'lifestyle' walking activity group) on autonomy, motivation, PBC, SE, and on physical fitness. The fitness centre activity group was a recommended 20 to 60 minutes of moderate to vigorous continuous physical activity (cardio-respiratory exercise) performed at 50-85% oxygen uptake reserve at a minimum frequency of 3 times per week, and a recommended frequency of 4 times per week (ACSM, 2000). The recommendation for duration began with 20 minutes and proceeded to 60 minutes per day over a 16-week training period. The level of intensity (50-85%) was also progressively increased over time. The

traditional fitness centre activity group was based on frequency, intensity, and duration, and therefore, required diligent scheduling and managing of one's day.

The prescription for the walking activity group was an accumulation of 60 minutes of physical activity, preferably in 10-minute blocks, everyday of the week through activities such as walking or stair climbing, thereby accumulating approximately 10, 000 steps per day (ACSM, 2000). This guideline might be more appealing to the general public as it does not require attending a fitness centre at specific blocks of time, and might be easier to assimilate into one's day. One lifestyle approach that has received attention is the 10, 000 steps program, which advocates that 10,000 steps per day is sufficient to accrue health benefits (Hatano, 1993, 1997). This prescription from Japanese researchers (Hatano, 1993, 1997) works out to approximately 5 miles or 8.05 kilometres of walking per day. The 10,000 steps program is normally monitored using pedometer readings, but does not address intensity, duration, or frequency.

Limitations of Previous Literature

Through the review of existing literature, several limitations that should be addressed by future studies were identified. Some research in SDT is cross-sectional and short-term in nature (Chatzisarantis & Biddle, 1998; Ntoumanis, 2001; Wilson & Rodgers, 2003). There are four main problems associated with cross-sectional studies. First, they cause questionnaires to be more vulnerable to consistency biases, which may increase relationships between variables (Armitage & Conner, 1999). This is due to the same type, age, or culture of participants (eg. undergraduate students) responding to questionnaires in the same way. If they all have the same type of response, relationships between constructs will increase, due to reduced variability in the sample. Second,

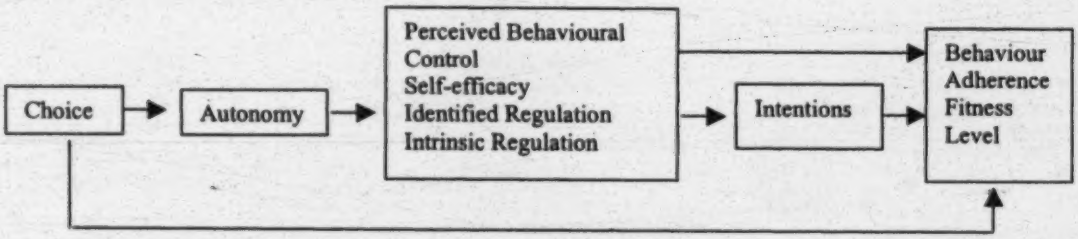
behavioural measures that are assessed simultaneously with measures of intention may be considered as past behaviour, which has been shown to predict future behaviour (eg. Sutton, 1994 in Armitage & Conner, 1999). If intentions and behaviour are assessed at the same timepoint, using the same wording, past behaviour tends to be reflected in intentions, rather than new information or future-oriented behavioural goals. Third, examination of the psychometric properties of the constructs is constrained to assessments of internal reliability. Fourth, cross-sectional measurement precludes testing of the causal links in the hypotheses (Armitage & Conner, 1999), as they are taken at only one timepoint.

A limitation of previous research is that several studies selected only one sex to be used as participants (Wilson & Rodgers, 2003), or one age group such as adolescents (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Markland, 1999; Ntoumanis, 2001; Patrick et al., 1993). Many studies in the exercise adherence area tend to generalize their results although they may not be completely generalizable due to limited samples (Chatzisarantis & Biddle, 1998; Hagger, et al., 2003). Furthermore, different measures for the constructs have been used (Biddle, 1999; Frederick-Recascino & Schuster-Smith, 2003; Patrick et al., 1993), and cases occur where there are not enough items utilized to accurately measure the construct (Markland, 1999; Patrick et al., 1993). More naturalistic conditions are required, rather than the supervised, controlled conditions evident in previous literature (Rodgers, Blanchard, Sullivan, Bell, Wilson, & Gesell, 2002). The current study will attempt to address the observable limitations of previous research by examining a large sample of adult men and women recruited from the broader community, over a 16-week period.

Current Study

The first purpose of this study was to evaluate the influence of choice of activity group on exercise adherence. A model (see Figure 1) based on the tenets of SDT (Deci & Ryan, 1985, 1991) and parts of TPB (Ajzen, 1988), was created to assess relationships among the variables of interest. The second purpose was to assess the proposed series of relationships specified in the model to examine potential theoretical mechanisms that might explain the influence of choice on exercise adherence.

Figure 1. Proposed Model.



To achieve this purpose, data were collected from the two activity groups over a 16-week period to determine (a) the effect of choice of activity group on levels of autonomy, (b) the effect of choice and autonomy on the more self-determined forms of behavioural regulation (identified and intrinsic regulation), PBC, and SE, and (c) the effectiveness of identified and intrinsic regulation, PBC, and SE, to predict intentions, exercise adherence, and result in improved fitness gains. To date there are no studies that have tested this model, despite the separate theoretical evidence (Ajzen, 1988; Deci & Ryan, 1985, 2002) underpinning its predictions and relationships.

Hypotheses

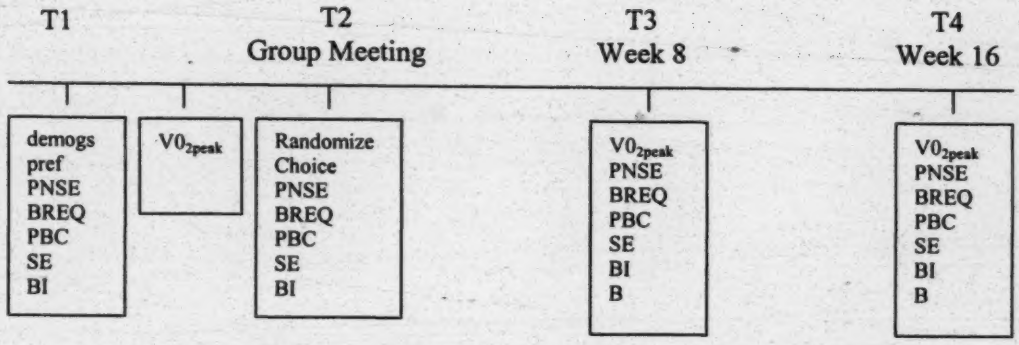
Drawing from previous research and theoretical arguments (Ajzen, 1988; Armitage & Conner, 1999, 2001; Deci & Ryan, 1985, 1991, 2002; Ntoumanis, 2001;

Patrick et al., 1993; Wilson & Rodgers, 2002, 2003, 2004), the main hypothesis was that choice of activity group would increase exercise adherence. Specifically, it was hypothesized that (a) choice of activity group would be positively associated with levels of autonomy, (b) autonomy would be positively associated with feelings of identified and intrinsic regulation, PBC, and SE and (c) the four mentioned constructs would positively influence BI (Wilson & Rodgers, 2004), which in turn would positively influence exercise adherence (Wilson, 2004; Wilson, et al., 2002) and result in fitness gains as shown by the VO_2peak tests. Support for these hypotheses will corroborate assertions of SDT and parts of TPB, as well as past research in the field.

Research Design

The study used a longitudinal experimental design with randomization to one of two conditions (choice or no-choice condition). The independent variable (choice of activity group) was deliberately manipulated to observe the subsequent effects on the dependent variables (autonomy, self-determined motivation, PBC, SE, BI, exercise adherence (B), and fitness). The study was a 2 (condition) x 3 (time) factorial design with repeated measures on the second factor for physiological measures and a 2 (condition) x 4 (time) factorial design with repeated measures on the second factor for psychological variables. The study period was 16 weeks. The current analysis focused on time 1 and time 2 psychological variables and their prediction of BI and adherence (B), as well as time 1, time 3, and time 4 physiological measures ($V0_2$peak).

Figure 2. Timeline.



This approach was employed because previous research examining SDT in exercise is usually non-experimental, and non-longitudinal, and it appeared beneficial to go beyond this by building upon previous research to utilize a longitudinal prospective factorial design. There are few studies that have combined parts of SDT, PBC and SE in this way by examining the links between autonomy, self-determined motivation, perceived behavioural control, and self-efficacy, to improve exercise adherence. This study attempted to build on key work by Wilson and colleagues (2002, 2003, 2004), Hagger and colleagues (2003), and Ntoumanis (2001), to further explain how to improve exercise adherence.

Several assumptions are made in this proposal. First, there is the assumption that autonomy, self-determined motives, PBC, SE, and BI, which are not physical constructs, exist and are measurable. Also, that links between these variables actually exist, and that prior research conclusions are valid. The assumption that questionnaires and measures already in use are applicable, valid, and reliable, will also have to be assumed and assessed, as no new questionnaires will be created for this study.

Method

Participants and Sampling

Sedentary adults aged 25 to 65 years of age, with no health conditions that would prohibit activity involvement, were recruited through posters around the university, an article and advertisement in the city newspaper, and through an advertisement in the Graduate Students Association on-line newsletter. Individuals were eligible for the trial if they were sedentary adults who required help initiating an exercise program because they had not exercised regularly in the last three months. The advertisements highlighted the incentives of free fitness tests, a free pedometer, and free fitness centre access, as well as an easy way to meet Canada's Physical Activity Guide (2004) recommendations for fitness and exercise.

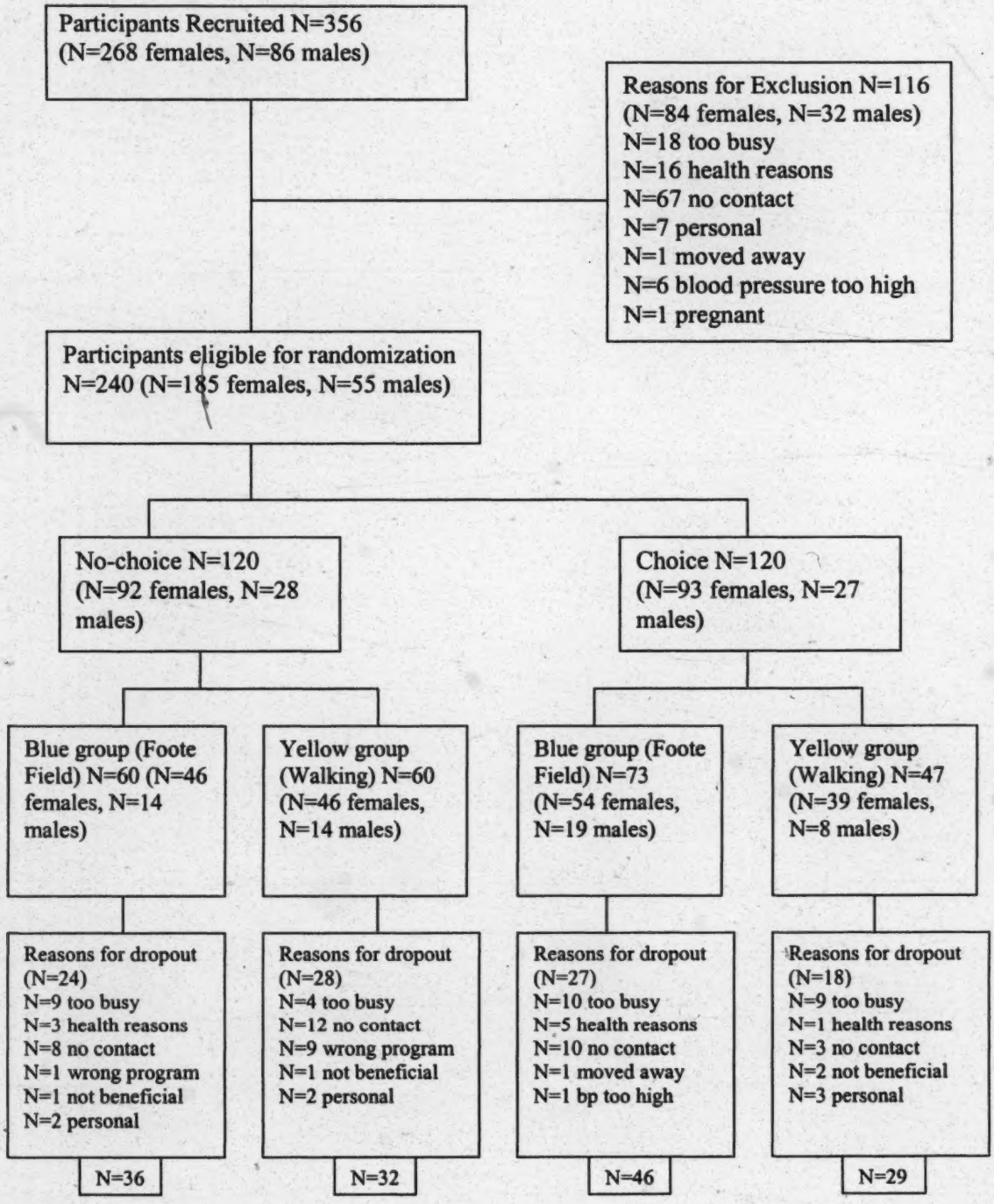
A total of 356 participants were recruited. Participant decline, ineligibility, non-completion, and dropout, resulted in a final sample of 143 who completed all aspects of the study. A total of 116 dropped out prior to randomization. Reasons for participant dropout are outlined in Figure 3. The participants are described in Table 1.

Table 1

Participant Descriptives

Variable	Choice		No-Choice	
	frequency	percent	frequency	percent
Age				
25-34	23	19	20	16.8
35-44	29	24	35	29.4
45-54	40	33.1	45	37.8
55-65	23	19	12	10.1
Partner in study				
yes	70	57.9	62	51.2
no	49	40.5	53	43.8
Preference				
fitness centre	53	43.8	65	53.7
walking	50	41.3	32	26.4
no preference	8	6.6	16	13.2
Dropout				
dropout	46	38	54	44.6
non-adherer	30	24.8	30	24.8
adherer	45	37.2	37	30.6
Marital status				
single	22	18.2	23	19
married	77	63.6	64	52.9
separated	5	4.1	4	3.3
divorced	10	8.3	12	9.9
widowed	0	0	2	1.7
common-law	5	4.1	8	6.6
Highest degree				
Less than gr. 12	4	3.3	6	5
High school/equiv	36	29.8	22	18.2
Bachelor's	28	23.1	35	28.9
Master's	9	7.4	9	7.4
Doctorate	4	3.3	1	.8
Professional	5	4.1	6	5
other	31	25.6	35	28.9

Figure 3. Flow of Participants through the Trial.



Procedures

At the information session (time 1), all recruits received a pedometer and were asked to track their steps everyday for one week. Research coordinators called or e-mailed participants after one week to retrieve their daily step count. Seven days of steps were averaged, and this was operationalized as the participants' baseline steps. The baseline steps were used as eligibility criteria to determine who was sedentary and for prescription purposes. On completion of the time 1 assessments, participants were randomly assigned to either the choice condition (choice of activity group: walking or fitness centre) or the no-choice condition. Participants randomized to the no-choice condition were further randomized to one of the two activity groups (walking or fitness centre). Participants in the walking activity group were required to reach an individually prescribed number of steps based on their baseline step count (using a pedometer as a monitoring tool), and time 1 fitness test, walking on their own. The target number of steps increased over time to create progressive overload similar to the fitness centre activity group. Participants in the fitness centre activity group were asked to exercise three times per week at an individually prescribed intensity using heart rate (based on the heart rate response from their time 1 fitness test) and to exercise on a treadmill, elliptical machine, or bike for the prescribed amount of time. Both the intensity and the duration of each 4-week exercise prescription were progressively overloaded to influence fitness level.

Assessment Schedule and Tracking

The fitness testing comprised three peak $V0_2$ tests using a graded treadmill test (Doan, Peterson, Blackmon, & Bruce, 1965), scheduled at pre (week 0), mid (week 8)

and post (week 16) intervention. The psychological parameters were assessed in the form of questionnaires at four time points over the study (information session; post randomization; midpoint (week 8); post (week 16)) (see Figure 2 (p. 23) for the assessment timeline). Participants were provided with calendars as an exercise activity log to complete as a self-report measure of adherence. The walking activity group filled in the number of steps they walked per day on the calendar. The fitness centre activity group also tracked their step count to ensure participants were not changing their daily step counts and they reported components of their workouts (duration, average heart rate, cardio machine). Details of the two activity groups are provided below.

Exercise Activity Groups

The exercise 'activity group' refers to the actual exercise program that the participant was involved in during the study, whereas 'walking based exercise' and 'fitness centre based exercise' refer to participants' thoughts regarding those exercise programs, regardless of the activity group they were part of.

Walking activity group. The lifestyle or walking activity was based on the 10,000 steps per day program (Hatano, 1993, 1997). Research shows that 10,000 steps per day increases activity level sufficiently to render health benefits such as lowering blood pressure and subcutaneous fat (Hatano, 1997) and it may provide protection against heart attacks (Paffenbarger, Wing, & Hyde, 1978). Giving participants a target number of steps per day has considerable merit as a public health recommendation, using a pedometer as a counting tool. This is a simple exercise method with immediate feedback on accumulated activity levels.

Personal prescriptions were developed by having participants wear a pedometer for one week to track their daily steps. A weekly step average was calculated and this became known as the participant's 'baseline steps.' The first prescription was baseline steps plus 1500 (weeks 1 to 4); the second prescription was baseline steps plus 3000 (weeks 5 to 8); the third prescription was baseline steps plus 4500 (weeks 9 to 12); and the fourth prescription was baseline steps plus 6000 (weeks 13 to 16). This prescription was over 10, 000 steps for many participants however, the prescriptions were kept consistent to have increases over the whole program rather than restricting participants to 10, 000 steps. The final prescription should have approximated an extra one hour of walking each day for each person.

Fitness centre activity group. The fitness centre exercise prescriptions were based on basic training principles (ACSM, 2000), which involve intensity, frequency, and duration. For these prescriptions, frequency and duration were consistent for all participants; however, personalized intensities (heart rate ranges) were prescribed. The intensity for fitness centre prescriptions was based on the participants' time 1 fitness tests. Heart rate ranges were calculated from the graded exercise treadmill test. The frequency of exercise was three times per week for the full 16 weeks of exercise. For weeks 1 to 4 participants were asked to exercise for 25 minutes at 60% of their highest heart rate attained during the peak $V0_2$ test, plus a warm-up and cool-down; for weeks 5 to 8, the prescription was raised to 35 minutes at 65% of their peak heart rate, plus a warm-up and cool-down; for weeks 9 to 12, the duration was 40 minutes at 70% of their peak heart rate, plus a warm-up and cool-down; and for weeks 13 to 16, participants were asked to exercise for 45 minutes at 75% of their peak heart rate, plus warm-up and cool-

down. This activity group also tracked their steps so that they would not exceed their prescriptions. They were to maintain their average baseline steps everyday, so that we could ensure that it was the traditional exercise program affecting fitness level and not an increase in overall lifestyle activity.

Assumptions for prescriptions. Some assumptions were utilized to ensure that the programs were approximately equated for work output. First, that 1000 steps takes about 10 minutes, and that expends approximately 0.053 kcals per step (Compendium of Physical Activities, 2000). It was also assumed that at 60% of $V0_2$peak, 7.5 kcals/min are expended; at 65% $V0_2$peak 8.75 kcals/min are expended; at 70% $V0_2$peak, 10 kcal/min are expended; and that at 75% $V0_2$peak, 11.25 kcal/min will be expended (Compendium of Physical Activities, 2000; Sport Performance and Health Assessment Centre, University of Alberta). Table 2 outlines the exercise prescriptions.

Table 2

Exercise Prescriptions for Activity Groups

Walking activity group	Weeks 1-4	Weeks 5-8	Weeks 9-12	Weeks 13-16
# of steps	Base + 1500	Base + 3000	Base + 4500	Base + 6000
Duration of increase (mins)	15	30	45	60
Energy Expended (kcal/wk)	556.5	1113	1670	2226
Fitness centre activity group				
# of steps	Base	Base	Base	Base
Duration (mins)	25+	35+	40+	45+
Intensity (%$V0_2$peak)	60	65	70	75
Frequency (days/wk)	3	3	3	3
Energy Expended (kcal/wk)	563	1050	1680	2250

Measures

Autonomy

Autonomy was measured using the Psychological Needs Satisfaction in Exercise scale (PNSE; Wilson, unpublished doctoral dissertation). This scale assessed the innate psychological needs of autonomy, relatedness, and competence. Questions from this scale that assessed autonomy include: "I decide what exercises I do; I feel free to choose exercise I participate in; I feel like I am in charge of my exercise program; I feel free to make my own exercise decisions; I feel free to exercise in my own way; I have a say in choosing exercises I do." Subscale scores were calculated by averaging the relevant items. This included six items assessed at four time points with the alpha scores of .92, .91, .93, and .94 respectively. Previous research indicates validity of the PNSE (Wilson, 2004). Only the autonomy items at time 1 and time 2 (not competence or relatedness) were analyzed in this study due to the proposed model (Figure 1, p. 21).

Perceived Behavioural Control

PBC for walking based exercise. PBC was measured as recommended by Ajzen & Madden (1986). Sample items include: "For me to walk a prescribed number of steps everyday of the week will be" (perceived difficulty); "If I wanted to, I could easily walk a prescribed number of steps everyday of the week" (self-efficacy); and "How much control do you feel you have over walking a prescribed number of steps everyday of the week?" (perceived control). Participants responded to each item on a 7-point Likert scale anchored at (1) "Extremely easy" or "Strongly disagree" or "Very little control" and (7) "Extremely difficult" or "Strongly agree" or "Complete control". Scores were calculated by averaging the three items. The 3-item subscale for PBC for walking based exercise,

assessed at four time points, had reliability scores of .68, .68, .72, and .69 respectively. Only time 1 and time 2 scores were required for analyses in the current study. Previous research suggests validity of the instrument (Ajzen, 1991; Ajzen & Madden, 1986).

PBC for fitness centre based exercise. PBC was measured as recommended by Ajzen & Madden (1986). Sample items include: "For me to exercise 3 times per week at a prescribed heart rate range will be" (perceived difficulty); "If I wanted to, I could easily exercise 3 times per week at a prescribed heart rate range" (self-efficacy); and "How much control do you feel you have over exercising 3 times per week at a prescribed heart rate range?"(perceived control). Participants responded to each item on a 7-point Likert scale anchored at (1) "Extremely easy" or "Strongly disagree" or "Very little control" and (7) "Extremely difficult" or "Strongly agree" or "Complete control". Scores were calculated by averaging the three items. For fitness centre based exercise, alpha scores were .66, .64, .66, and .82 over the four time points. Only time 1 and time 2 scores were required for analyses in the current study. Previous research suggests validity of the instrument (Ajzen, 1991; Ajzen & Madden, 1986).

Self-efficacy

Self-efficacy for walking based exercise. Self-efficacy was assessed using a questionnaire developed by Rodgers and Sullivan (2001), measuring the three types of SE, which are task efficacy, coping efficacy, and scheduling efficacy, using a 100% scale. Items included: "Complete your activity using proper technique" (task efficacy; 3 items); "Be active when you lack energy" (coping efficacy; 3 items); and "Arrange your schedule to include regular activity" (scheduling efficacy; 3 items). Following the stem, "How confident are you that you can…" participants responded to each item indicating a

percentage of total confidence, anchored at (0%) "No confidence" and (100%) "Complete confidence." These measures were assessed through instructions at the beginning of the SE questionnaire stating "Physical activity is defined as accumulating 10 000 steps per day every day of the week." Subscale scores were calculated by averaging the relevant items. For task efficacy for walking based exercise, alpha scores ranged from .84 to .92. With respect to coping efficacy for walking based exercise, scores ranged from .86 to .91, and for scheduling efficacy for walking based exercise, scores ranged from .89 to .92. Only time 1 and time 2 measures were required for analyses. Previous research indicates that this measure is both valid and reliable (Rodgers, et al., 2002; Rodgers & Sullivan, 2001).

Self-efficacy for fitness centre based exercise. Self-efficacy was assessed using a questionnaire developed by Rodgers and Sullivan (2001), measuring the three types of SE, which are task efficacy, coping efficacy, and scheduling efficacy, using a 100% scale. Items included: "Complete your activity using proper technique" (task efficacy; 3 items); "Be active when you lack energy" (coping efficacy; 3 items); and "Arrange your schedule to include regular activity" (scheduling efficacy; 3 items). Following the stem, "How confident are you that you can…" participants responded to each item indicating a percentage of total confidence, anchored at (0%) "No confidence" and (100%) "Complete confidence." These measures were assessed through instructions at the beginning of the SE questionnaire stating "Physical activity is defined as exercising at a fitness facility on a treadmill or bike for 20-40 minutes, three times per week, at a moderate intensity." Subscale scores were calculated by averaging the relevant items. For task efficacy for fitness centre based exercise, scores ranged from .91 to .96. With respect to coping

efficacy for fitness centre based exercise, alpha scores ranged from .90 to .93, and scores for scheduling efficacy for fitness centre based exercise ranged from .92 to .95. Only time 1 and time 2 measures were required for analyses. Previous research indicates that this measure is both valid and reliable (Rodgers, et al., 2002; Rodgers & Sullivan, 2001).

PBC and SE measures. For PBC and SE, all participants responded to questions regarding both types of exercise programs. Therefore, there were questions regarding walking based exercise and fitness centre based exercise that received responses from all participants regardless of which activity group they participated in during the study.

Self-determination

Motivation for exercise was assessed utilizing the Behavioural Regulation in Exercise Questionnaire (BREQ; Mullan et al., 1997). The BREQ is a 15-item self-report measure for assessing the reasons why people exercise. The BREQ operationalizes exercise motivation along a graded self-determination continuum and includes scales that assess external, introjected, identified, and intrinsic regulation of exercise behaviour. For this study, only the most self-determined forms of regulation were analyzed, therefore, due to the model (Figure 1, p. 21) the analyses were computed using scores for identified and intrinsic regulation only. Example items include: "I value the benefits of exercise" (identified regulation; 4 items); and "I enjoy exercise sessions" (intrinsic regulation; 4 items). Following the stem, "Why do you exercise?" participants responded to each item on a 5-point Likert scale anchored at (0) "Not true for me" and (4) "Very true for me". Subscales were calculated by averaging the four items. Alpha scores for identified regulation at the four time points were .73, .74, .70, and .76, respectively. For intrinsic regulation alpha scores were .90, .92, .92, and .94, respectively. Only time 1 and time 2

scores were required for analyses. Previous research has suggested that the BREQ is reliable (Mullan, Markland, & Ingledew, 1997) and a valid discriminator of different behavioural regulations (Mullan & Markland, 1997; Wilson, et al., 2002).

Behavioural Intentions

Intentions were assessed based on the recommendations of Courneya and McAuley (1993). Sample intentions included, "You intend to exercise regularly during the next 4 months", "You intend to exercise at least 3 times per week over the next 4 months" and "You intend to participate in regular exercise as much as you can every week over the next 4 months." Participants responded to each item on a 7-point Likert scale anchored at (1) "Strongly disagree" or "Definitely not" and (7) "Strongly agree" or "Definitely". An overall behavioural intention (BI) score was calculated by averaging the three items.

Exercise Adherence

Walking activity group. The primary dependent variable, exercise adherence, was assessed through a self-report calendar for recording the number of steps per day for the walking activity group. Exercise adherence was assessed by adding up all the steps that participants reported for each 4-week study period and this 4-week total was then averaged by the number of days in that prescription. This resulted in four averages, which were added and then converted to a percentage of total possible steps for that person.

Fitness centre activity group. For the fitness centre activity group, self-report exercise logs included the number of workouts per week, activity, intensity, and average heart rate for the workout. The fitness centre activity group was also asked to track the

number of steps they took per day, so that they could maintain an average similar to the number of steps they had been walking prior to the trial, and therefore, only increase in exercise at the fitness centre. For this activity group, adherence was assessed by adding the number of times participants exercised, which was converted to a percentage of total possible workouts in the prescription, and the number of steps was evaluated the identical way as for the walking activity group.

Aerobic Fitness

Peak oxygen uptake ($V0_2peak$) was used to assess aerobic fitness. Open circuit spirometry was utilized to measure metabolic responses while exercising on a treadmill. The protocol was adapted from previous research (Kaminsky & Whaley, 1998). The $V0_2peak$ (L/min) score was used as the measure of fitness level. We have utilized the "$V0_2peak$" as in sedentary populations it is thought that the actual $V0_2max$ is not achieved; therefore the fitness scores are known as $V0_2peak$ scores. This tends to occur in sedentary individuals because they often feel that maximal exercise is too difficult and that striving to achieve maximum exercise intensity might harm them, so they stop the test prior to reaching their true maximum oxygen uptake. This testing procedure has been confirmed through previous research (Bell, Snydmiller, Davies, & Quinney, 1997; Webster, Horne, Wheelans, & Bell, 1999).

Analyses

The psychological components (questionnaires) were assessed at all four time points, however; only time 1 and time 2 scores were required for analyses. The physiological components were assessed at three time points (baseline, midpoint, and post-intervention) due to the absence of exercise from baseline to post-randomization.

Zero-order correlations of all variables are reported in Appendix A. The results assessed the relationships highlighted in the proposed model (Figure 1, p. 21) through MANOVA and hierarchical regressions. Although not customary, two approaches (MANOVA and regression) were utilized to examine the data. The MANOVA was utilized to compare between-groups results with respect to condition (choice/no-choice) and activity group (fitness centre/walking), whereas the regressions were used as a prediction tool. The MANOVA assessed the influence of choice and activity group on all dependent variables examining change from time 1 to time 2. With respect to the regressions, separate regressions were completed for fitness centre based exercise and walking based exercise, as the questions assessing the variables were specific to each type of exercise, but all participants responded to both sets of questions. The regressions assessed the prediction of BI, and B (adherence). The separate models in the hierarchical regressions addressed the parts of the proposed model (Figure 1, p. 21). With respect to missing data, 4.65% of the data was replaced by imputing the mean for the specific group, for the missing variable.

Descriptive Data

Table 3 outlines all descriptive data for the psychological variables assessed in the study. All means and standard deviations are presented with respect to condition (choice/no-choice) and activity group (walking/fitness centre) for all variables.

Table 3

Descriptive Data on Psychological Variables

	Choice				No-Choice			
	Walking (n=42)		Fitness Centre (n =68)		Walking (n =54)		Fitness Centre (n =51)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Autonomy								
Time 1	4.83	.88	4.65	.93	4.63	1.03	4.79	1.10
Time 2	4.88	.88	4.68	1.01	5.08	.67	5.05	.77
PBC W								
Time 1	5.45	1.21	5.20	1.25	5.38	1.28	5.49	1.26
Time 2	5.69	.99	5.24	1.35	5.44	1.13	5.60	1.32
PBC FC								
Time 1	4.82	1.39	5.54	1.13	5.23	1.36	5.40	1.27
Time 2	4.71	1.29	5.74	.94	5.17	1.42	5.88	.91
Task Eff W								
Time 1	88.43	13.20	88.47	11.52	86.99	12.83	87.13	14.24
Time 2	90.99	10.05	88.62	11.36	90.61	14.94	89.83	11.15
Task Eff FC								
Time 1	85.39	13.23	91.20	10.87	83.51	16.79	88.21	11.36
Time 2	82.24	17.14	90.01	9.76	84.33	17.47	88.02	14.70
Cope Eff W								
Time 1	73.10	18.86	72.40	16.78	72.37	18.80	72.22	19.00
Time 2	75.79	16.11	74.07	16.84	72.17	18.88	74.97	17.35
Cope Eff FC								
Time 1	70.75	20.07	76.62	16.16	72.60	17.33	74.21	18.68
Time 2	70.25	18.42	78.52	14.53	70.42	18.23	76.91	16.76
Sched Eff W								
Time 1	84.78	13.56	81.29	14.65	82.38	17.11	81.45	16.27
Time 2	84.84	13.15	80.89	16.68	81.29	19.42	81.28	16.89
Sched Eff FC								
Time 1	73.55	22.18	83.74	14.14	80.31	19.08	81.00	14.82
Time 2	72.07	18.06	85.07	12.25	75.73	21.31	82.51	13.92
Identified								
Time 1	2.74	.71	2.60	.80	2.63	.96	2.66	.85
Time 2	2.64	.72	2.71	.78	2.63	.88	2.67	.80
Intrinsic								
Time 1	2.25	1.04	2.01	.87	2.38	1.07	2.34	.93
Time 2	2.36	.98	2.09	.93	2.33	.97	2.26	.94
BI								
Time 1	5.13	1.67	5.14	1.85	5.43	1.59	5.61	1.53
Time 2	6.40	.91	6.54	.63	6.31	.87	6.54	.55

Time 1 Data Comparison

Choice versus no-choice conditions. This analysis was much like a manipulation check to ensure that the randomization procedures worked properly. These results show that there were no statistically significant differences in Time 1 measurements between the choice and no-choice conditions $F(12, 202) = 1.32$, $p = .21$. Table 4 outlines the results.

Table 4

Time 1 Data: Choice versus No-choice

Variable	Choice (n =110)		No-Choice (n =105)		F (1, 215)	*p*
	Mean	SD	Mean	SD		
Autonomy	4.72	.91	4.71	1.06	.00	.99
PBC W	5.30	1.24	5.44	1.26	.67	.41
PBC FC	5.26	1.28	5.31	1.31	.08	.78
Task Eff W	88.46	12.13	87.06	13.51	.64	.43
Cope Eff W	72.67	17.53	72.29	18.81	.02	.88
Sched Eff W	82.62	14.28	81.90	16.61	.12	.73
Task Eff FC	88.98	12.11	85.93	14.38	2.85	.09
Cope Eff FC	74.37	17.90	73.42	17.97	.15	.70
Sched Eff FC	79.16	19.76	80.67	16.95	.36	.55
Identified Reg	2.66	.77	2.65	.90	.01	.92
Intrinsic Reg	2.10	.94	2.34	1.02	3.08	.08
Behav Intent	5.14	1.77	5.52	1.56	2.82	.09

The Effect of Choice and Activity Group on Dependent Variables from Time 1 to Time 2

A repeated measures MANOVA approach to examining the influence of choice on all the dependent variables was completed to account for variance from time 1 variables that would influence observations at time 2. Results are presented in Table 5. A 2 (condition: choice/no-choice) x 2 (activity group: fitness centre/walking) x 2 (time) repeated measures MANOVA showed significant results for the between subjects activity group factor (fitness centre/walking) $F(12, 200) = 4.33$, $p<.001$***, and the within subjects time factor $F(12, 200) = 11.47$, $p<.001$***. However, there was not a significant effect for condition (choice/ no-choice), and there were not significant interactions. Univariate follow-up analyses for the between subjects activity group factor (fitness centre/walking) showed significant results for PBC for fitness centre based exercise $F(1, 211) = 20.03$, $p<.001$***, task efficacy for fitness centre based exercise $F(1, 211) = 10.61$, $p<.001$***, coping efficacy for fitness centre based exercise $F(1, 211) = 6.39$, $p<.01$**, and scheduling efficacy for fitness centre based exercise $F(1, 211) = 14.00$, $p<.001$***, indicating that those in the fitness centre activity group had positive changes from time 1 to time 2 on all these variables. For within subjects effects, analyses revealed that BI increased significantly over time $F(1, 211) = 92.12$, $p<.001$***, as did autonomy $F(1, 211) = 8.86$, $p<.001$***, and task efficacy for walking based exercise $F(1, 211) = 6.93$, $p<.01$**.

Table 5

Repeated Measures MANOVA Examining the Influence of Choice and Activity Group on all Dependent Variables Accounting for Change from Time 1 to Time 2

Source	df	F	Partial eta^2	*p*
		Between subjects		
Condition (C) (Choice/ No-choice)	12	1.42	.08	.16
Activity Group (G) (Fitness Centre/ Walking)	12	4.33***	.21	.00
C X G	12	1.33	.07	.21
Error	200			
		Within subjects		
Time (T)	12	11.47***	.41	.00
T X C	12	1.47	.08	.14
T X G	12	1.11	.06	.36
T X C X G	12	.55	.03	.88
Error	200			

Note: p<.001***.

The Effect of Choice on Adherence

To address the main purpose of the study, which was to determine the effect of choice on exercise adherence, an ANOVA was completed to obtain a general understanding of the role of choice, and to approach the data from a different perspective. The dependent variable was percent adherence scored as a percentage of total possible adherence. The choice and no-choice groups were found to be significantly different from

each other $F(1, 240) = 3.79$, $p<.05$*, ES = .02. Those in the choice group had a higher adherence percentage than did participants in the no-choice condition. The behavioural data is illustrated in Table 6 below.

Table 6

Exercise Adherence Data (Behaviour)

	Choice				No-Choice			
	Walking (N= 29)		Fitness Centre (N= 46)		Walking (N=32)		Fitness Centre (N= 36)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
% adh	80.12	25.06	78.22	18.85	78.70	26.80	73.73	26.90

The Prediction of Behavioural Intentions

The next analysis concerned the prediction of time 2 BI. The intention measure examined as the dependent variable was a measure of general BI. The assessment of time 2 BI occurred directly post-randomization, when participants were told which condition they were randomized to (choice or no-choice). Separate hierarchical regressions were conducted for all participants' responses regarding walking based exercise (Table 7) and fitness centre based exercise (Table 8). All participants were included in the analysis regardless of their own activity group, because all participants answered questions for both types of exercise programs. Time 1 measures were entered first, followed by condition (choice/no-choice) and activity group (fitness centre/walking) followed by time 2 measures that were taken directly post-manipulation when the effect of choice was expected to be the most prominent. The variables were entered in this order to control for the effects of time 1 variables, then for condition (choice/no-choice) and activity group (fitness centre/ walking) and to then observe the effects of the time 2 variables, to examine if they explained more variance in the dependent variable.

For the prediction of time 2 BI, all time 1 variables were entered at step 1, including BI, autonomy, identified and intrinsic regulation, PBC for walking based exercise/fitness centre based exercise and time 1 task, coping, and scheduling efficacy for walking based exercise/fitness centre based exercise. Step 2 included condition (choice/ no-choice) and activity group (fitness centre/walking). All time 2 variables were entered at step 3, including time 2 autonomy, time 2 identified and intrinsic regulation, time 2 PBC for walking based exercise/fitness centre based exercise and time 2 task, coping, and scheduling efficacy for walking based exercise/fitness centre based exercise. BI were entered prior to all other variables, as intentions would be most proximal to behaviour.

For walking based exercise (Table 7), in Model 1, the significant predictors of time 2 BI, included time 1 BI, and time 1 identified regulation. In Model 2, both variables remained significant predictors, however, in Model 3, the significant predictors included time 1 intrinsic regulation, which had a negative β, indicating a negative relationship. The activity group variable (fitness centre/walking) was also significant showing that those in the fitness centre activity group had stronger time 2 BI for walking based exercise. Time 2 identified regulation was also a significant predictor of time 2 BI for walking based exercise.

Table 7

All Participants' Responses Regarding Walking Based Exercise

Summary of Regression Analysis for the Prediction of Time 2 Behavioural Intentions (BI)

Variable	R^2	ΔR^2	B	SE B	β	*t*	*p*
Dependent:							
T2 Behavioural Intentions							
Model 1:	.12						
T1 BI			.07	.03	.17	2.30	.02*
T1 autonomy			.06	.05	.08	1.16	.25
T1 identified regulation			.16	.07	.19	2.22	.03*
T1 intrinsic regulation			-.11	.06	-.15	-1.77	.08
T1 PBC walking			.05	.05	.09	1.14	.26
T1 task efficacy walking			.01	.01	.11	1.15	.25
T1 coping efficacy walking			-.00	.00	-.09	-.81	.42
T1 sched efficacy walking			.00	.01	.06	.52	.61
Model 2:	.13	.02					
T1 BI			.07	.03	.16	2.24	.03*
T1 autonomy			.06	.05	.08	1.17	.25
T1 identified regulation			.16	.07	.18	2.15	.03*
T1 intrinsic regulation			-.10	.06	-.13	-1.56	.12
T1 PBC walking			.06	.05	.09	1.15	.25
T1 task efficacy walking			.01	.01	.10	1.06	.29
T1 coping efficacy walking			-.00	.00	-.10	-.92	.36
T1 sched efficacy walking			.00	.01	.08	.69	.49
Choice/no choice			.04	.10	.03	.37	.71
Fitness centre/walking			-.18	.10	-.12	-1.85	.07
Model 3:	.22	.08					
T1 BI			.06	.03	.14	1.90	.06
T1 autonomy			.02	.06	.02	.28	.78
T1 identified regulation			.02	.09	.03	.26	.80
T1 intrinsic regulation			-.15	.08	-.20	-2.04	.04*
T1 PBC walking			.08	.05	.13	1.41	.16
T1 task efficacy walking			.01	.01	.10	.99	.33
T1 coping efficacy walking			-.00	.01	-.11	-.90	.37
T1 sched efficacy walking			.00	.01	.01	.04	.97
Choice/no choice			.06	.10	.04	.60	.55
Fitness centre/walking			-.20	.10	-.13	-2.04	.04*
T2 autonomy			.13	.07	.15	1.92	.06
T2 identified regulation			.21	.09	.22	2.20	.03*
T2 intrinsic regulation			.09	.08	.11	1.11	.27

T2 PBC walking	-.08	.05	-.14	-1.58	.12
T2 task efficacy walking	.01	.01	.13	1.18	.24
T2 coping efficacy walking	-.01	.01	-.12	-1.03	.30
T2 sched efficacy walking	.01	.01	.17	1.37	.17

Note: Model 1 $F(8, 206) = 3.36$, $p<.001$***; Model 2 $F(10, 204) = 3.09$, $p<.001$***; Model 3 $F(17, 197) = 3.17$, $p<.001$***.

The fitness centre based exercise results are presented in Table 8. In Model 1, time 1 identified regulation and time 1 intrinsic regulation (negative β) were significant predictors of time 2 BI for fitness centre based exercise. In Model 2, time 1 identified regulation was a significant predictor. In Model 3, time 2 autonomy emerged as a significant predictor, as did time 2 identified regulation, and time 2 scheduling efficacy for fitness centre based exercise.

Table 8

All Participants' Responses Regarding Fitness Centre Based Exercise

Summary of Regression Analysis for the Prediction of Time 2 Behavioural Intentions (BI)

Variable	R^2	ΔR^2	B	SE B	β	*t*	*p*
Dependent:							
T2 Behavioural Intentions							
Model 1:	.11						
T1 BI			.06	.03	.14	1.91	.06
T1 autonomy			.08	.05	.10	1.47	.14
T1 identified regulation			.19	.07	.21	2.58	.01**
T1 intrinsic regulation			-.12	.06	-.16	-1.99	.05*
T1 PBC fitness			.00	.05	.00	.02	.98
T1 task efficacy fitness			.01	.01	.08	.94	.35
T1 coping efficacy fitness			-.00	.00	-.03	-.29	.77
T1 sched efficacy fitness			.00	.00	.10	.98	.33
Model 2:	.12	.01					
T1 BI			.06	.03	.14	1.92	.06
T1 autonomy			.08	.05	.10	1.49	.14
T1 identified regulation			.19	.07	.21	2.51	.01**
T1 intrinsic regulation			-.11	.06	-.15	-1.79	.07
T1 PBC fitness			-.00	.05	-.01	-.08	.93
T1 task efficacy fitness			.00	.01	.06	.70	.49

T1 coping efficacy fitness			-.00	.00	-.02	-.22	.83
T1 sched efficacy fitness			.00	.00	.10	.93	.35
Choice/no choice			.03	.10	.02	.29	.78
Fitness centre/walking			-.14	.10	-.09	-1.35	.18
Model 3:	.21	.10					
T1 BI			.06	.03	.13	1.76	.08
T1 autonomy			.02	.06	.02	.27	.79
T1 identified regulation			.04	.09	.04	.39	.70
T1 intrinsic regulation			-.13	.07	-.18	-1.80	.07
T1 PBC fitness			.03	.05	.04	.56	.58
T1 task efficacy fitness			-.00	.01	-.02	-.17	.87
T1 coping efficacy fitness			-.00	.01	-.02	-.16	.87
T1 sched efficacy fitness			-.00	.01	-.02	-.21	.83
Choice/no choice			.07	.10	.05	.72	.47
Fitness centre/walking			-.09	.10	-.06	-.90	.37
T2 autonomy			.16	.07	.19	2.46	.02*
T2 identified regulation			.20	.09	.22	2.15	.03*
T2 intrinsic regulation			.02	.08	.02	.23	.82
T2 PBC fitness			-.03	.05	-.06	-.67	.51
T2 task efficacy fitness			.01	.01	.13	1.23	.22
T2 coping efficacy fitness			-.01	.01	-.14	-.97	.33
T2 sched efficacy fitness			.01	.01	.27	2.40	.02*

Note: Model 1 $F(8, 206) = 3.18$, $p<.001$***; Model 2 $F(10, 204) = 2.74$, $p<.001$***; Model 3 $F(17, 197) = 3.16$, $p<.001$**.

The Prediction of Behaviour (exercise adherence)

The next step was to assess the prediction of behaviour operationalized as exercise adherence. A percentage of total possible adherence was used as the indicator of behaviour for the dependent variable in this analysis. The rationale for the order of the variables is the same as that for the prediction of time 2 BI. First, to address the relationship of the variables to behaviour, we did a hierarchical regression analysis by entering the time 1 variables at step 1, including BI, autonomy, identified and intrinsic regulation, PBC for walking based exercise/fitness centre based exercise, and time 1 task, coping, and scheduling efficacy for walking based exercise/fitness centre based exercise. At step 2, condition (choice/no-choice) and actual activity group (walking/fitness centre)

were entered. At step 3, the time 2 variables were entered including time 2 BI, time 2 autonomy, time 2 identified and intrinsic regulation, time 2 PBC for walking based exercise/fitness centre based exercise and task, coping, and scheduling efficacy for walking based exercise/fitness centre based exercise.

For walking based exercise (see Table 9), in Model 1, time 1 autonomy and time 1 identified regulation significantly predicted adherence and remained significant in Model 2. However, in Model 2, time 1 identified regulation had a negative β, showing that those with lower identified regulation had greater adherence. Model 3 was not significant, showing that none of the time 2 variables were significant predictors of adherence for walking based exercise.

Table 9

All Participants' Responses Regarding Walking Based Exercise

Summary of Regression Analysis for the Prediction of Adherence

Variable	R^2	ΔR^2	B	SE B	β	*t*	*p*
Dependent: Adherence							
Model 1:	.09						
T1 BI			-2.72	1.52	-.13	-1.79	.08
T1 autonomy			5.10	2.52	.14	2.03	.04*
T1 identified regulation			-7.28	3.54	-.17	-2.06	.04*
T1 intrinsic regulation			-1.49	2.98	-.04	-.50	.62
T1 PBC walking			1.57	2.28	.06	.69	.49
T1 task efficacy walking			-.46	.26	-.17	-1.81	.07
T1 coping efficacy walking			.23	.21	.12	1.10	.27
T1 sched efficacy walking			.04	.27	.02	.14	.89
Model 2:	.10	.01					
T1 BI			-2.52	1.53	-.12	-1.65	.10
T1 autonomy			5.07	2.52	.14	2.01	.05*
T1 identified regulation			-7.83	3.56	-.19	-2.20	.03*
T1 intrinsic regulation			-.90	3.01	-.03	-.30	.77
T1 PBC walking			1.80	2.29	.06	.79	.43
T1 task efficacy walking			-.47	.26	-.17	-1.84	.07

T1 coping efficacy walking			.23	.21	.12	1.10	.28
T1 sched efficacy walking			.03	.27	.01	.10	.92
Choice/no-choice			6.38	4.77	.09	1.34	.18
Fitness centre/walking			-.54	4.75	-.01	-.11	.91
Model 3:	.13	.03					
T1 BI			-3.37	1.58	-.16	-2.13	.04*
T1 autonomy			4.26	2.77	.12	1.54	.13
T1 identified regulation			-12.57	4.50	-.30	-2.80	.01**
T1 intrinsic regulation			1.50	3.81	.04	.39	.70
T1 PBC walking			1.38	2.68	.05	.51	.61
T1 task efficacy walking			-.56	.30	-.21	-1.87	.06
T1 coping efficacy walking			.21	.24	.11	.88	.38
T1 sched efficacy walking			-.04	.30	-.02	-.15	.88
Choice/no choice			6.34	4.91	.09	1.29	.20
Fitness centre/walking			1.48	4.92	.02	.30	.76
T2 BI			5.30	3.57	.11	1.49	.14
T2 autonomy			1.34	3.32	.03	.41	.69
T2 identified regulation			6.54	4.75	.15	1.38	.17
T2 intrinsic regulation			-4.05	3.94	-.11	-1.03	.31
T2 PBC walking			-.00	2.61	-.00	-.00	1.00
T2 task efficacy walking			-.01	.33	-.01	-.04	.97
T2 coping efficacy walking			.20	.26	.10	.76	.45
T2 sched efficacy walking			.01	.27	.01	.04	.97

Note: Model 1 $F(8, 206) = 2.60$, $p<.01$**; Model 2 $F(10, 204) = 2.27$, $p<.02$*; Model 3 $F(18, 196) = 1.63$, $p>.05$.

For fitness centre based exercise (Table 10), with respect to the prediction of exercise adherence, in Model 1 and 2, time 1 autonomy, time 1 identified regulation (negative β), time 1 task efficacy for fitness centre based exercise (negative β), and time 1 coping efficacy for fitness centre based exercise were significant predictors. In Model 3, time 1 identified regulation and time 1 task efficacy for fitness centre based exercise remained significant predictors of exercise adherence, however, the relationship was negative. Therefore, the final model indicates that exercise adherence for fitness centre based exercise is predicted by time 1 identified regulation and time 1 task efficacy for fitness centre based exercise. The negative βs, indicate that those with lower identified regulation and lower task efficacy had greater adherence.

Table 10

All Participants' Responses Regarding Fitness Centre Based Exercise

Summary of Regression Analysis for the Prediction of Adherence

Variable	R^2	ΔR^2	B	SE B	β	*t*	*p*
Dependent: Adherence							
Model 1:	.13						
T1 BI			-2.56	1.53	-.12	-1.67	.10
T1 autonomy			5.75	2.43	.16	2.37	.02*
T1 identified regulation			-7.83	3.43	-.19	-2.28	.02*
T1 intrinsic regulation			-.79	2.89	-.02	-.27	.79
T1 PBC fitness			-2.03	2.11	-.08	-.96	.34
T1 task efficacy fitness			-.73	.23	-.28	-3.18	.00***
T1 coping efficacy fitness			.43	.21	.22	2.05	.04*
T1 sched efficacy fitness			-.01	.21	-.00	-.02	.98
Model 2:	.15	.02					
T1 BI			-2.33	1.54	-.11	-1.52	.13
T1 autonomy			5.86	2.42	.17	2.42	.02*
T1 identified regulation			-8.54	3.45	-.20	-2.48	.01**
T1 intrinsic regulation			.13	2.92	.00	.05	.96
T1 PBC fitness			-2.08	2.11	-.08	-.99	.33
T1 task efficacy fitness			-.81	.23	-.31	-3.46	.00***
T1 coping efficacy fitness			.43	.21	.22	2.05	.04*
T1 sched efficacy fitness			.01	.21	.00	.04	.97
Choice/no-choice			7.55	4.67	.11	1.61	.11
Fitness centre/walking			-3.83	4.73	-.05	-.81	.42
Model 3:	.18	.04					
T1 BI			-2.81	1.57	-.14	-1.78	.08
T1 autonomy			4.89	2.72	.14	1.80	.07
T1 identified regulation			-12.55	4.33	-.30	-2.90	.00***
T1 intrinsic regulation			2.05	3.63	.06	.57	.57
T1 PBC fitness			-1.12	2.21	-.04	-.51	.61
T1 task efficacy fitness			-.83	.25	-.32	-3.27	.00***
T1 coping efficacy fitness			.33	.25	.17	1.34	.18
T1 sched efficacy fitness			-.01	.22	-.01	-.06	.95
Choice/no-choice			7.33	4.83	.11	1.52	.13
Fitness centre/walking			-2.78	5.06	-.04	-.55	.58
T2 BI			5.66	3.46	.12	1.64	.10
T2 autonomy			2.45	3.27	.06	.75	.46
T2 identified regulation			5.09	4.63	.12	1.10	.27
T2 intrinsic regulation			-3.77	3.63	-.10	-1.04	.30

T2 PBC fitness	-2.27	2.52	-.08	-.90	.37
T2 task efficacy fitness	-.20	.27	-.08	-.74	.46
T2 coping efficacy fitness	.27	.30	.13	.89	.38
T2 sched efficacy fitness	.07	.24	.04	.30	.77

Note: Model 1 $F(8, 206) = 3.89$, $p<.001$***; Model 2 $F(10, 204) = 3.49$, $p<.001$***; Model 3 $F(18, 196) = 2.40$, $p<.001$***.

The Effect of Activity Group (walking/fitness centre) on Fitness Level

A 2 (group) x 3 (time) repeated measures ANOVA was conducted to examine the effect of activity group (walking or fitness centre) on fitness level. Results showed that there was a main effect for group $F(1, 136) = 8.80$, $p<.001$***, and a main effect for time $F(2, 135) = 6.22$, $p<.001$***, showing that there was a significant difference between the two activity groups, and that there was a significant increase in fitness level over time. No significant interactions resulted, indicating that both groups increased fitness level to the same extent, over time. Table 11 presents results for the analysis, and Tables 12 to 14 present the descriptive data for each activity group.

Table 11

Analysis of Variance for Fitness Level ($V0_2$ L/min) by Activity Group

Source	df	F	Partial eta^2	*p*
		Between subjects		
Activity Group (walking/ fitness centre)	1	8.80***	.06	.00
Error	136			
		Within subjects		
Time	2	6.22***	.08	.00
Time x Group	2	2.24	.03	.11
Error	135			

Note: $p<.001$***.

Table 12

Peak Fitness Level ($V0_2$ L/min)

	Choice						No-Choice					
	Walking			Fitness centre			Walking			Fitness Centre		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Time 1	42	2.12	.43	68	2.35	.69	51	2.10	.52	54	2.37	.60
Time 2	35	2.11	.37	56	2.48	.69	36	2.17	.57	42	2.43	.63
Time 3	27	2.07	.36	46	2.48	.64	30	2.16	.59	35	2.42	.63

Table 13

Physiological Variables Walking Activity Group

Variable	T1 (N=93)		T2 (N=72)		T3 (N=57)	
	M	SD	M	SD	M	SD
Age	47.07	10.19	49.11	9.32	49.81	9.19
Height (cm)	164.12	7.20	163.78	7.06	164.18	7.37
Body mass (kg)	83.96	18.52	85.81	18.79	83.46	19.22
BMI (kg/hgt m^2)	31.12	6.43	31.95	6.57	30.90	6.60

Table 14

Physiological Variables Fitness Centre Activity Group

Variable	T1 (N=122)		T2 (N=99)		T3 (N=77)	
	M	SD	M	SD	M	SD
Age	43.69	9.16	44.55	8.49	44.84	8.31
Height (cm)	167.10	7.67	167.27	7.26	167.06	7.08
Body mass (kg)	86.95	21.68	85.00	21.49	83.70	20.01
BMI (kg/hgt m^2)	31.05	7.02	30.20	6.41	29.87	6.23

Summary

The only analysis where choice had a significant effect was in the ANOVA showing the direct effect of choice on adherence. Overall, the results were inconsistent, showing that the choice manipulation did not have a significant effect on BI or B (adherence), in the regressions. The final model in the regressions revealed significant effects of some of the variables on BI and adherence. For the prediction of time 2 BI with respect to walking based exercise, time 1 identified regulation, the fitness centre

activity group, and time 2 identified regulation were significant. With respect to fitness centre based exercise, significant predictors of time 2 BI, included time 2 autonomy, time 2 identified regulation, and time 2 scheduling efficacy for fitness centre based exercise. For the prediction of adherence in walking based exercise, the final model was not significant, therefore, there were no significant predictors once time 2 variables were entered. For fitness centre based exercise, significant predictors of adherence included time 1 identified regulation, and time 1 task efficacy for fitness centre based exercise. Overall, it seems that time 1 variables (baseline measures) more readily predicted exercise adherence, the most important dependent variable in this study, and that time 2 variables predicted time 2 BI.

Discussion

The present study was designed to investigate whether choice of activity group would affect adherence to exercise and fitness level. Choice was expected to influence autonomy, PBC, SE, identified and intrinsic regulation, BI, exercise adherence, and fitness level. In general, the hypothesis that choice would significantly affect these variables was not supported. Choice did not have any significant effect on these variables, with the exception of a direct effect of choice on exercise adherence.

Time 1 Data Comparison

As a manipulation check to ensure that our randomization procedures were effective, a comparison of time 1 data between the choice and no-choice conditions was analyzed. No significant differences in any variables emerged between the two conditions, verifying the effectiveness of the randomization procedure.

Choice of activity group and self-efficacy. An important issue discussed by Ajzen (1991) is that choice of activity can be influenced by self-efficacy; therefore, it is possible that some participants chose a certain program based on their self-efficacy perceptions. Examination of self-efficacy in the choice condition showed that those who chose the fitness centre activity group reported significantly higher task (FC = 91.20%; W = 85.24%), coping (FC = 76.62%; W = 70.75%), and scheduling efficacy (FC = 85.74%; W = 73.55%) for the fitness centre based exercise compared to those who chose the walking activity group. This appears to be consistent with Ajzen's (1991) findings suggesting that self-efficacy did influence participants' choice of activity, specifically those who chose the walking activity group. Their lower self-efficacy for fitness centre based exercise influenced their choice of activity group. This reflects a selection argument rather than a change argument, showing that the pre-existing social cognitive measures (time 1 data), predicted the choice that participants would make, as opposed to participants changing their mind about which program to choose. Being able to predict a participant's choice based on pre-existing social cognitive measures is a contribution to the literature on this topic.

The Effect of Choice and Activity Group on Dependent Variables from Time 1 to Time 2

To examine the effect of choice on differences in time 1 and time 2 variables, a repeated measures MANOVA was completed. According to the results, there was no effect for condition (choice/ no-choice); however, there was a significant effect for activity group (fitness centre/ walking). It seems that the fitness centre activity group had significantly higher PBC, task, coping, and scheduling efficacy, than the walking activity group. This may be due to the idea that fitness centre based exercise may be perceived

more like an exercise program than walking based exercise, therefore, significant results ensued for the control-type variables associated with fitness centre based exercise. For the within subjects factors, significant increases occurred in BI, autonomy, and task efficacy for walking based exercise. No interactions occurred, illustrating that choice did not affect any of the variables from time 1 to time 2. Intuitively, once participants knew which activity group they were assigned to, their BI would become more stable, and their autonomy may have increased due to the choice manipulation. With respect to task and coping efficacy for walking based exercise, it may be that participants had a clearer view of what was expected of them, and therefore, their confidence for walking based exercise increased. It should be noted that for behaviour such as walking, PBC is high from baseline, so there was no room for change, however, participants who were randomized to the fitness centre activity group may have perceived greater control once they were told about the program and what was expected of them.

The Effect of Choice on Exercise Adherence

The approach to examining the effect of choice on exercise adherence was through ANOVA procedure to address the main purpose of the study. Results showed that the choice and no-choice conditions were significantly different than each other with respect to exercise adherence. This is the only significant analysis demonstrating the effectiveness of the choice manipulation on exercise adherence. This showed that choice of activity group does influence exercise adherence, however, the mechanism underlying this relationship was not explained through the variables assessed in this study. This does however appeal to previous research showing that a simple choice manipulation with two alternatives influenced exercise adherence significantly.

The Prediction of Behavioural Intentions

Regression analyses were carried out to evaluate the influence of the variables of interest (time 1 and time 2) on BI at time 2 immediately following the choice manipulation. For walking based exercise, it was found that once all variables were entered, the significant predictors included time 1 intrinsic regulation (negative β), the fitness centre activity group, and time 2 identified regulation. Prior research indicates that this is a common occurrence with exercise due to the reasons motivating individuals to carryout this type of behaviour (Wilson, 2004; Wilson et al., 2002, 2003, 2004). Intrinsic regulation is difficult to develop in exercise behaviour, but identification occurs more readily. Interestingly, the fitness centre activity group had greater time 2 BI for walking based exercise. This could be due to their confidence for a behaviour they must do everyday as opposed to exercise in a fitness centre, which they perceive as more difficult.

For fitness centre based exercise, the final model illustrated that the significant predictors of time 2 BI included time 2 autonomy and time 2 scheduling efficacy for fitness centre based exercise. Feeling autonomous influences more stable intentions in this sample. As indicated previously, identified regulation is usually a significant predictor in exercise settings. Scheduling efficacy seems to be important with respect to fitness centre based exercise because participants must plan it into their day as it requires proper clothing, proper time, leaving the house, and attending before or after work, to name a few of the implications of this program. Scheduling efficacy and BI are significantly correlated in this sample ($r = .21$, $p<.01$). This finding is consistent with self-efficacy theory (Bandura, 1986) and with the theory of planned behaviour (Ajzen, 1988).

The Prediction of Behaviour (exercise adherence)

The prediction of exercise adherence was also assessed through regressions which first controlled for time 1 variables, then choice and activity group, and then time 2 variables were entered into the analysis. For walking based exercise, the final model was not significant, therefore, no significant predictors ensued. This demonstrates that once time 2 variables were entered, non-significant results occurred. This may be because walking is something that most people do everyday, so participants felt confident and in control of walking even if they did not adhere to their prescriptions. In other words, all participants had high scores for all measures, including the dropouts, which would result in a negative association over time as people with high scores had low adherence. All groups had relatively high PBC scores. These results support Ajzen's (1991) propositions, revealing that a familiar activity such as walking is associated with high PBC. Self-efficacy scores were also high, resulting in low variance and minimal room for association with another variable. Walking is such a common occurrence in people's lives; therefore cognitions about it might not be the best way to explain behaviour.

For fitness centre based exercise, the two significant predictors of adherence were time 1 identified regulation and time 1 task efficacy, but a negative relationship ensued. Over-ambitious participants may not have been able to adhere to the fitness centre activity group once they realized its difficulty. It is also possible that by actually carrying out exercise behaviour, those individuals began to identify with it over time and knew that they could perform the task. The same reasoning could be applied here, that high and table scores on the variables and low and unstable scores for adherence, can only result in a negative relationship.

Overall, BI predicted adherence, but then lost significance once numerous other variables were introduced into the analysis. Interestingly, PBC did not predict behaviour in this sample. This is not expected with relation to TPB (Ajzen, 1985, 2002), however, with a behaviour such as walking, which most people are in complete control of; the theory of reasoned action may be a better way of understanding this behaviour. Literature shows that PBC and BI are both important in predicting behaviour, but only one of the two may be required. Ajzen (1991) states, "both, intentions and perceptions of behavioral control, can make significant contributions to the prediction of behavior, but in any given application, one may be more important than the other and, in fact, only one of the two predictors may be needed" (p. 185). Another factor that might have influenced the lack of significant predictions is again, the uniformly high scores at the time 1 assessment. The low variance in time 1 measures reduced the possibility of certain variables being able to relate to percent adherence, which had high variability.

It seems that the prediction of adherence from the variables assessed at time 1 and time 2 was not consistent with all theoretical expectations. With respect to BI, which, based on theory should have been the most proximal predictor of behaviour; descriptives show that BI were extremely high. Future research could address the change in relationship between intentions and behaviour in these situations where, at the onset, all the participants have strong intentions to change their behaviour. The relationship of choice to exercise adherence could not be explained with the specified variables and statistical techniques, although many interesting relationships emerged.

The Effect of Activity Group (fitness centre/walking) on Fitness Level

To examine the effect of activity group on fitness level, a repeated measures ANOVA was conducted. Results showed main effects for group and time, indicating that the groups were significantly different from each other, and that there were increases over time. However, the interaction was not significant, indicating that both groups increased fitness level over time. Intuitively, the fitness centre activity group should have had a larger fitness increase; however, this is promising for lifestyle approaches to fitness in that walking can increase fitness over time as well.

General Discussion Summary

In general, it seems that the prediction of BI, and B had different predictors. Time 2 BI were predicted by time 2 variables, however, adherence (behaviour) was only significantly predicted by time 1 variables. With respect to time 2 BI, specificity of time and measurement were key factors in the significance of time 2 variables in the analyses. Although the principle of compatibility (Ajzen, 1988) relates to attitudes, it may be applied here, as the elements of action, target, context, and time (Conner & Norman, 2005) were all important factors in the significance of time 2 variables predicting time 2 BI.

As for the prediction of exercise adherence, it is possible that the time 2 measurements were so specific that they did not address the overall adherence to the program. The time 1 measurements were more generalized to exercise overall, and therefore, were better predictors of participants' overall adherence to the activity group. Variability in time 1 measures was greater and therefore, was a better predictor of adherence, which also had high variability. Another important factor is that completing a

questionnaire about a particular behaviour is very different than actually doing the behaviour (Conner & Norman, 2005). Therefore, the gap between perceptions while filling out a questionnaire, and actual behaviour may have been quite high in this sample.

Identified regulation seemed to be a strong predictor in the analyses. Reasoning and motivation for beginning an exercise program might be expected to be more to the extrinsic side of the continuum (Deci & Ryan, 1985, 2002). For example, motives such as losing weight, looking better, spouse pressure, friend pressure, vacation, health reasons, etc., may be of importance rather than intrinsic motives, such as pure enjoyment of exercise at the onset of a program. Future studies should examine both the mean levels of regulatory forms, and also the variance around them, which might be an important indicator of how motivation develops over time. Also, very few people are fully intrinsically motivated (Deci & Ryan, 1985, 2002), as most individuals exhibit some form of extrinsic motivation, especially after only 16 weeks of exercise.

In summary, choice of activity group had a significant effect on adherence to exercise. The effect of choice on the psychological variables in the study was minimal. Choice of activity group did not seem to affect PBC, SE, identified or intrinsic regulation significantly in this sample, which was not expected.

There are several possible explanations as to why the choice manipulation may not have affected autonomy, PBC, SE, identified, intrinsic regulation. One reason is that participants volunteered to be in a study where they did not think they would have any choice. All participants entered the study believing that they would be assigned an activity group with no choice in the matter. So perhaps all that mattered to participants was that they received some type of exercise program, but the actual type of program was

not important. Participants had already resolved to be there; therefore, a choice of activity group was an added bonus but did not change their overall perceptions of autonomy. Additionally, time 1 autonomy scores were very high, so any further manipulation of factors likely to influence autonomy was unlikely to produce meaningful change in this sample.

An important factor influencing the null findings for the effect of choice on the psychological variables is that within and throughout exercise programs, choices are always being made. For example, all participants, regardless of condition (choice/ no-choice) were making daily choices regarding where to exercise, when to exercise, what time of day to exercise, and with whom, to name a few. Therefore, all participants were still making choices about their exercise program, even after it was assigned to them.

Another factor worthy of consideration is that the no-choice condition was unaware that the others had a choice of activity group; therefore, they did not know that they were missing the benefit. This may have affected results because participants may have responded differently to the questionnaires if they were aware that they did not have the choice that the other group had. The perception of relatively less choice might have directly affected PBC scores, as well as the motivational variables. Future studies should consider the impact of allowing all groups to know the nature of the study or the manipulation itself. In this study, if we had allowed for knowledge of the manipulation, it may have influenced participants' perceptions of personal autonomy, control, and motivation.

An alternative interpretation of why the choice manipulation may not have been effective involves the choice itself and the circumstances surrounding the way it was

manipulated. Recall that participants attended an information meeting where no mention of choice was made. They volunteered to take part with the expectation that they would be given a specific exercise program, and that they would have no control over the type of program. Then participants were randomized to either the choice or no-choice condition, and asked to attend a meeting where they would find out about their respective exercise programs. Those in the choice condition attended this meeting expecting to be given their exercise activity group. Then the researchers told them that they were able to choose an activity group, and that the decision was their own. Because participants had already committed to the study as observed in their already consistently high scores on all variables of interest, the choice manipulation had little additional effect. Future research could examine different ways of manipulating choice including making participants aware that some will get a choice and some will not, or by removing choice, or by examining a longer term choice manipulation such as giving participants more responsibility for each exercise session rather than having a one-time-only surprise provision of choice to half the sample. Overall, it is important to recognize that choice directly affected exercise adherence, but this effect cannot be understood by the other variables assessed in this study (PBC, SE, identified and intrinsic regulation).

Limitations

Several limitations of this study were encountered. These limitations should be taken into consideration when assessing these results. First, a convenience sample was recruited, as participants volunteered to be in the study, and therefore they were motivated to exercise before the study began. This may have been a major influence on the findings as the samples' motivation levels and BI were high initially and it is possible

that scores could not increase substantially and also had very little variance. Participants were not expecting a choice; therefore, it was more like a bonus rather than a disappointment, which might have had a different motivational effect. The initially very high scores on most variables showed that these participants were highly motivated, confident, and perceived that they were in control, right from the beginning, and therefore, there was no room for significant improvement, regardless of the intervention. Random selection was not possible in this study, which reduced external validity. However, we were trying to generalize to an adult population, so our sample was community adults, rather than university psychology classes contributing to sample relevance.

We recruited both males and females to participate in the study; however, our sampling procedures resulted in substantially more females. A limitation of our study was that due to the small number of men, we could not examine the differences between men and women as anticipated. Future research could attempt to recruit more men so that statistical comparisons can be examined.

There were two very different types of exercise programs available (fitness centre and walking). Participants in the fitness centre activity group received more one-to-one treatment and supervision from the researchers, whereas the walkers were only e-mailed or phoned once a week. Also, the fitness centre activity group participants could exercise with others in a facility, whereas the walkers were mostly on their own, or had to ask others to walk with them. The fitness centre activity group also used heart rate monitors and therefore participants always knew the intensity of their workouts and could self-regulate, whereas the walkers only had pedometers as a monitoring tool. Also, it is

possible that walking may not be considered 'exercise' by some participants and may have affected the study results as well. In general, people walk everyday to get to where they are going, therefore, this may be thought of as a necessity rather than an exercise technique. One concern is that differential physical effects of the exercise prescriptions may have confounded results, as the activity groups were quite different with respect to intensity, frequency, and time involved. It is possible that the fitness increases experienced by the fitness centre activity group independently influenced their adherence.

There is a possibility that variance in the fitness testing procedures might have influenced results. There were several fitness testers, therefore, there was variability in testers and participants did not always have the same testers and differences could have occurred and affected the fitness results. All testers are trained the same way with the exact procedures; however, personality characteristics of the testers and of the participants may have affected procedures. The study coordinator was present at all fitness tests to monitor regularity and reliability. Although major care was taken to ensure that procedures were carried out consistently at all times, differences still may have occurred and affected results.

An important limitation of the current study involves questionnaires. In all questionnaires, there is the possibility that variables may have been misunderstood, and therefore, the answers may not have reflected the correct meanings or interpretations. Although great care was taken in ensuring that participants had ample opportunity to ask questions and to get clarification, it still may be that participants interpreted some of the questionnaires differently or incorrectly. Also, all responses are necessarily self-report which reflect biases in the sample including socially desirable responding. In this study it

is possible that participants wanted to appear as positive as possible about exercise, which may have been a factor in the observed high and consistent scores reported.

Summary and Future Directions

The overall purpose of this study was to examine the effects of choice of exercise activity group on PBC, SE, motivation, BI, exercise adherence, and fitness level. It was hypothesized that choice of exercise activity group would positively influence PBC, SE, identified, and intrinsic regulation. In addition, it was assumed that PBC, SE, identified and intrinsic regulation, would have positive direct effects on exercise behaviour (Ajzen, 1988, Deci & Ryan, 2002). The constructs of PBC, SE, identified and intrinsic regulation would in turn influence BI, which influenced greater exercise adherence to the participant's chosen activity group.

The present results showed that the choice manipulation was not strong enough to influence the numerous psychological variables assessed in this study. The positioning of the choice manipulation or the number of choices might be factors to consider in future research. It is possible that participants had to make daily choices to exercise or not, and this may be where choice occurs, not at the beginning of the program with a one-time choice of activity group. Stronger or greater frequency manipulations of choice may create different results. Recall that Chatzisarantis and Biddle (1998) created groups in which one experienced greater autonomy, and the other was treated in a more controlled fashion. It is possible that our study could have emphasized choice throughout the study, not just once, and created a greater difference in the two groups by composing a more autonomous versus controlled environment. The consistency of perceptions of autonomy may be more important than single experiences of choice. Future research is required

utilizing a much stronger choice manipulation, possibly ensuring that no participants receive their preference which might have different effects. An alternative choice manipulation could examine the choice between an exercise program and a control group waiting list, which may increase the chance of an effect of choice being observed.

Future research studies could examine the degree to which people need to feel autonomous in a variety of exercise environments and the long-term effects of these interventions aimed at promoting autonomy or choice and the effects on improving both motivation and exercise participation. Future research could also have tighter monitoring of exercise programs to aid participants in carrying them out properly. With fitness testing, it would be beneficial to have only two or three testers so that procedure is almost 100% identical at all fitness tests. Also, with respect to the advertisements for the study, it may have been beneficial to state that some people would be able to choose which activity group they wanted, because most participants signed up with the impression that they would be assigned an exercise program, therefore they had a preconceived idea which may have decreased the effectiveness of the choice manipulation. In conclusion, further research is required to identify the mediating mechanisms underlying the relationship between choice and exercise adherence, utilizing the concept of choice and assessing its effectiveness.

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Appendix A

Correlation Tables

Table A1

Time 1 Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. aut	1											
2. pbcw	.19**	1										
3. pbcf	-.08	.28**	1									
4. taskw	.22**	.38**	.19**	1								
5. copew	.15*	.38**	.49**	.66**	1							
6. schedw	.13*	.51**	.62**	.64**	.80**	1						
7. taskf	.14*	.21**	.42**	.58**	.46**	.43**	1					
8. copef	.04	.24**	.46**	.50**	.74**	.59**	.68**	1				
9. schedf	-.06	.22**	.62**	.31**	.46**	.51**	.60**	.75**	1			
10. ident	.21**	.23**	.07	.14*	.16**	.19**	.08	.10	.08	1		
11. intrin	.15**	.31**	.22**	.08	.25**	.25**	.20**	.27**	.25**	.61**	1	
12. bi	.09	.17**	.20**	.04	.09	.13*	.09	.19**	.23**	.39**	.37**	1

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table A2

Correlations Time 2 Variables and Dependent Variables: Fitness Centre Based Exercise

Variable	1	2	3	4	5	6	7	8	9	10
1. Choice	1									
2. aut	-.20**	1								
3. pbc	-.08	.15*	1							
4. task	.03	.07	.52**	1						
5. cope	.04	.09	.52**	.78**	1					
6. sched	.01	.02	.59**	.73**	.81**	1				
7. ident	-.01	.28**	.05	.02	.09	.06	1			
8. intrin	-.08	.25**	.11	.11	.24**	.17**	.59**	1		
9. bi	.02	.24**	.17**	.16*	.14*	.21**	.29**	.12*	1	
10. adh	.09	.01	-.18**	-.13*	-.06	-.09	-.11	-.11	-.01	1

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table A3

Correlations Time 2 Variables and Dependent Variables: Walking Based Exercise

Variable	1	2	3	4	5	6	7	8	9	10
1. Choice	1									
2. aut	-.18**	1								
3. pbc	-.02	.25**	1							
4. task	-.05	.17**	.41**	1						
5. cope	.01	.20**	.44**	.65**	1					
6. sched	.02	.19**	.52**	.67**	.74**	1				
7. ident	.02	.27**	.21**	.02	.18**	.16**	1			
8. intrin	-.04	.25**	.26**	.04	.29**	.18**	.59**	1		
9. bi	.02	.22**	.13*	.16**	.10	.20**	.27**	.11	1	
10. adh	.09	.00	-.05	.00	.03	.02	-.10	-.10	.01	1

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Appendix B

Questionnaires

Questionnaire B1

Behavioural Intentions

The following concerns **YOUR PLANS** for exercising during the next month. Please circle the most appropriate response for you.

(a) I intend to exercise regularly during the next month?

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

(b) I intend to exercise at least 3 times per week over the next month?

1	2	3	4	5	6	7
Definitely Not						Definitely

(c) I intend to participate in regular exercise as much as I can every week over the next month

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

Questionnaire B2

Perceived Behavioural Control for Walking Based Exercise

For me to accumulate 10 000 steps per day, every day of the week will be:

1	2	3	4	5	6	7
Extremely Easy			Moderately Easy/Difficult			Extremely Difficult

If I wanted to, I could easily accumulate 10 000 steps per day, every day of the week.

1	2	3	4	5	6	7
Strongly Disagree	Moderately Disagree	Slightly Disagree		Slightly Agree	Moderately Agree	Strongly Agree

How much control do you feel you have over accumulating 10 000 steps per day, every day of the week?

1	2	3	4	5	6	7
Very Little Control			Moderate Control			Complete Control

Questionnaire B3

Perceived Behavioural Control for Fitness Centre Based Exercise

For me to exercise for 20-40 minutes at a fitness facility on a treadmill or bike, three times per week, at a moderate intensity will be:

1	2	3	4	5	6	7
Extremely Easy			Moderately Easy/Difficult			Extremely Difficult

If I wanted to, I could easily exercise for 20-40 minutes, three times per week, at a moderate intensity.

1	2	3	4	5	6	7
Strongly Disagree	Moderately Disagree	Slightly Disagree		Slightly Agree	Moderately Agree	Strongly Agree

How much control do you feel you have over exercising at a fitness facility on a treadmill or bike for 20-40 minutes, three times per week, at a moderate intensity?

1	2	3	4	5	6	7
Very Little Control			Moderate Control			Complete Control

Questionnaire B4

Self–efficacy for Walking Based Exercise

Please indicate HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM each of the activity related tasks below. Physical activity is defined as accumulating 10 000 steps per day, every day of the week.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No confidence										Complete Confidence

How confident are you that you can...	
Complete your activity using proper technique	%
Follow directions to complete the activity	%
Perform all of the movements required for your activity	%
Exercise when you feel discomfort from the activity	%
Be active when you lack energy	%
Include activity in your daily routine	%
Consistently be active every day of the week	%
Be active when you don't feel well	%
Arrange your schedule to include regular activity	%

Questionnaire B5

Self-efficacy for Fitness Centre Based Exercise

Please indicate HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM each of the activity related tasks below. Physical activity is defined as exercising at a fitness facility on a treadmill or bike for 20-40 minutes, three times per week, at a moderate intensity.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No confidence										Complete Confidence

How confident are you that you can...	
Complete your activity using proper technique	%
Follow directions to complete the activity	%
Perform all of the movements required for your activity	%
Exercise when you feel discomfort from the activity	%
Be active when you lack energy	%
Include activity in your daily routine	%
Consistently be active 3 times per week	%
Be active when you don't feel well	%
Arrange your schedule to include regular activity	%

Questionnaire B6

Psychological Needs Satisfaction in Exercise

The following statements represent different experiences people have when they exercise. Please answer the following questions by considering how YOU TYPICALLY feel while you are exercising.	False	Mostly False	More false than true	More true than false	Mostly True	True
(a) I feel that I am able to complete exercises that are personally challenging	1	2	3	4	5	6
(b) I feel attached to my exercise companions because they accept me for who I am	1	2	3	4	5	6
(c) I feel like I share a common bond with people who are important to me when we exercise together	1	2	3	4	5	6
(d) I feel confident I can do even the most challenging exercises	1	2	3	4	5	6
(e) I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons	1	2	3	4	5	6
(f) I feel confident in my ability to perform exercises that personally challenge me	1	2	3	4	5	6
(g) I feel close to my exercise companions who appreciate how difficult exercise can be	1	2	3	4	5	6
(h) I feel free to exercise in my own way	1	2	3	4	5	6
(i) I feel free to make my own exercise program decisions	1	2	3	4	5	6
(j) I feel capable of completing exercises that are challenging to me	1	2	3	4	5	6
(k) I feel like I am in charge of my exercise program decisions	1	2	3	4	5	6
(l) I feel like I am capable of doing even the most challenging exercises	1	2	3	4	5	6
(m) I feel like I have a say in choosing the exercises that I do	1	2	3	4	5	6
(n) I feel connected to the people who I interact with while we exercise together	1	2	3	4	5	6
(o) I feel good about the way I am able to complete challenging exercises	1	2	3	4	5	6
(p) I feel like I get along well with other people who I interact with while we exercise together	1	2	3	4	5	6
(q) I feel free to choose which exercises I participate in	1	2	3	4	5	6
(r) I feel like I am the one who decides what exercises I do	1	2	3	4	5	6

Questionnaire B7

Behavioural Regulation in Exercise Questionnaire

For the questions below, exercise means engaging in regular physical activity, at a moderate intensity. Please respond how true FOR YOU each of the following statements are:	Not true	Sometimes true	Moderately true	Often true	Very true
I feel like a failure when I haven't exercised in a while	0	1	2	3	4
I don't see the point in exercising	0	1	2	3	4
I get restless if I don't exercise regularly	0	1	2	3	4
I think it is important to make the effort to exercise regularly	0	1	2	3	4
I find my exercise a pleasurable activity	0	1	2	3	4
It's important to me to exercise regularly	0	1	2	3	4
I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
I feel under pressure from my friends/family to exercise	0	1	2	3	4
I exercise because it is fun	0	1	2	3	4
I exercise because other people say I should	0	1	2	3	4
I feel ashamed when I miss an exercise session	0	1	2	3	4
I exercise because others will not be pleased with me if I don't	0	1	2	3	4
I don't see why I should have to exercise	0	1	2	3	4
I enjoy my exercise sessions	0	1	2	3	4
I think exercising is a waste of time	0	1	2	3	4
I feel guilty when I don't exercise	0	1	2	3	4
I take part in exercise because my friends/family/spouse say I should	0	1	2	3	4
I can't see why I should bother to exercise	0	1	2	3	4
I value the benefits of exercise	0	1	2	3	4